INTER AVIA

Review of World Aviation

In this Issue:

Spheres of Influence and U.S. Rearmament

Jet Fighter 1948 — Fighter Armament — Fiat G 212

Aircraft for the Masses — Back to the Postchaise

The Late Robert Kronfeld : The Problem of the Freight Glider

K.L.M. / From the Zuider Zee to the South Seas

VOLUME III No 4 APRIL, 1948

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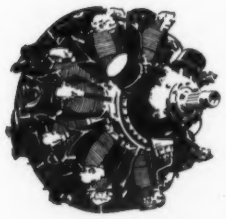

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Review of World Aviation

OFFICIAL ORGAN OF THE FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE (F. A. I.)

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Empennage and rear gunner's station of the B-45 four-jet bomber

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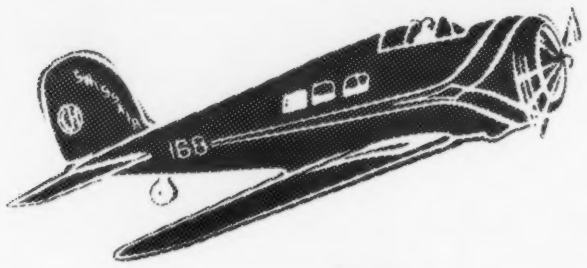

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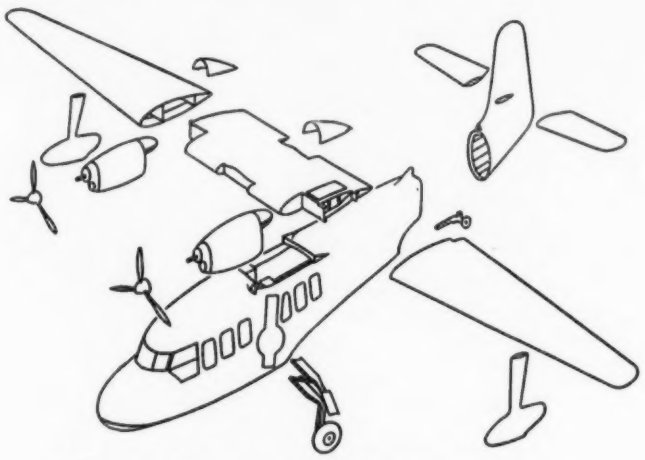

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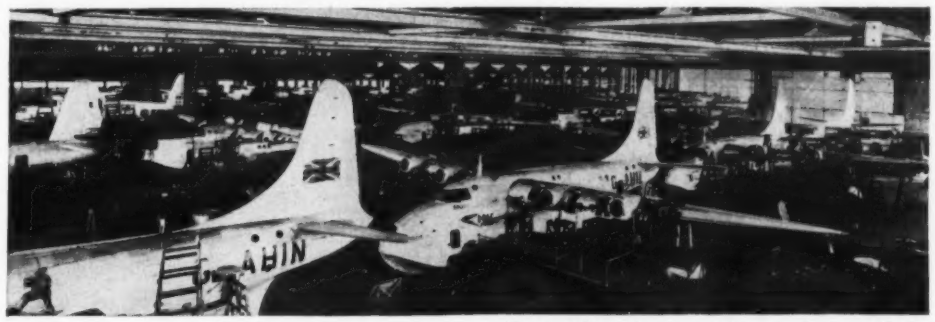

Shorts Belfast factory: Solents nearing completion.

* * * * * * * * * * * * * * *

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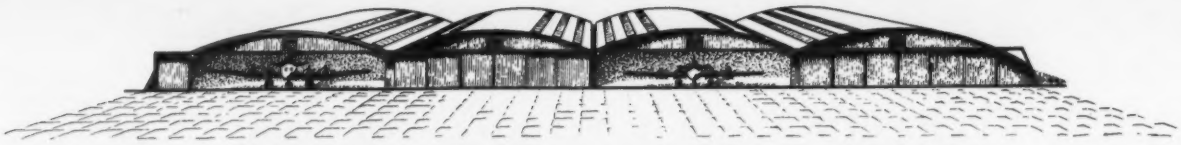

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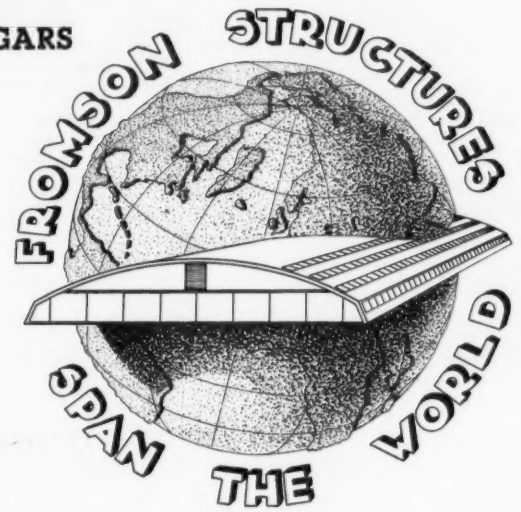

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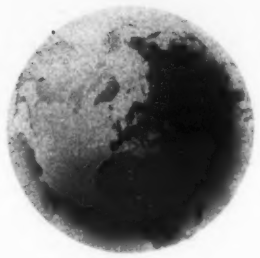


Lost Balance

Spring is in the air !

At the beginning of March the House of Commons deliberated on the new British Defence Budget. Care was taken to avoid very detailed figures, whilst a year ago no effort was made to conceal them and much talk went on about economy measures. It was announced that the British Navy, like the U.S. Navy, is to be reorganised : battleships are to be committed to the scrap-heap, aircraft carriers are to be built at an increased rate, and the Queen of the Seas is no longer to be the battleship, but the Fleet Air Arm. It was declared that Britain held the lead in jet engines and could take on "all comers" in the interceptor fighter class, and that the R.A.F. is to be equipped with jet bombers of exceptional performance. The idea behind this is plain enough from the latest U.S. reports on rearmament : "A second-best air force, when war takes place, is almost as bad as none."

And what about the latest American reports on rearmament, which form the object of a more detailed analysis elsewhere in this magazine. One of these documents bears the promising title of "Survival in the Air Age," which, after all, also suggests the possibility of our not surviving the air age.

* * *

Politics and rearmament. This time civil aviation has not gone home empty-handed, neither in the West nor in the East.

In May, 1947, men representing every branch of U.S. aviation betook themselves hurriedly to Washington and implored their Government not to allow the aircraft manufacturing industry and the airline business to go bankrupt. In March, 1948, there were obvious signs that their pleas had been heard. Manufacturing activities and commerce began to pick up again. And, strange to say, civil aviation is also leaning on the military for support—at least for the time being.

Let us take an example in the person of Cyrus R. Smith, Chairman of American Airlines, Inc., and President of American Overseas Airlines. During World War II, the first rearmament, he was given the rank of General. During that time his company, then a major domestic carrier, developed into a concern of world-wide importance, flying from the west to the east coast, and from the U.S. east coast to Europe. By the time he had got as far as Europe, Mr. Smith wanted to penetrate further eastward and extend his network into the Soviet Union. But when he arrived at the Finnish terminal of Helsinki, Mr. Stalin signalled him to halt. A little later American Airlines pilots went on strike, and there was the added nuisance of the grounding of a major part of the carrier's fleet. Indeed, Mr. Smith had plenty to worry about. And now ? Everything is fine again in the A.A. family. The U.S. Government cannot and will not let him down, because his carrier is after all a reserve for the event of war. To put it in a nutshell : Cyrus R. Smith, and others like him, owe the first part of their meteoric rise to Adolf Hitler, and in the new posture of affairs, Mr. Molotov, or the master of the Kremlin, is safeguarding their interests.

Don't be misled for a minute into thinking that Stalin or Russian civil aviation is at a standstill. This field is widening in Russia, too. New commercial transport aircraft are under way : a twin-engined 27-passenger airliner, the IL-12, which may be reminiscent of the good old "Dakota" but is larger and about 60 m.p.h. faster than its progenitor ; a four-engined TU-70 airliner for 72 passengers, which is a little B-29-ish ; and a new 66-passenger transport, the IL-18.

The centre of this aeronautical activity is Moscow, whence air services radiate towards the North, the East, the South, and even towards the West—exactly as air services radiate from New York towards London, Paris, Rome, and even Frankfurt-on-Main.

Civil aviation is being modernised again in Germany. On March 2nd American Overseas Airlines opened a Frankfurt—Berlin route, over which Germans are also authorised to fly ; and a Frankfurt—Munich service is to follow shortly. Americans and Russians, French and Czechs, Dutch and Swedes—all these nations are once more flying to and over Germany. Prospectuses for passenger and freight transport are again being printed in German. Yes, Spring is in the air.

Just try to imagine what it means to people who can hardly find enough to eat and haven't any proper roofs over their heads, and in whose country there are only single tracks of railways lines joining even the largest cities. It costs 110 marks to fly from Berlin to Frankfurt, which is equivalent to the price of a packet of "Camels." Flights cost money—above all in Germany ! New vistas have been opened to the Black Market.

* * *

One man's meat is another man's poison. What I would like to know is how the Czechoslovakians, under their new constellation or with their three new "Constellations," mean to start the North Atlantic service they announced for next May. During that month the Sokol Gymnastic Festival is scheduled to take place. The intention is to stage a massive celebration and, with the new Atlantic service, to bring memories of home to the Americans of Czech origin and to the Czechs resident in the U.S.A. Will their memories really be stimulated ?

Readers may be asking themselves what we are driving at with this omnium gatherum of agreeable and disagreeable items—as usual, the weight being on the disagreeable side. Well, we merely want to give you a whiff of 1948's Spring perfume. And only on one point can we give you any consolation : in principle, nothing has changed, at least not since 1919. The formulae are perhaps presented otherwise, but the facts remain the same.

A very brilliant U.S. journalist of Czech origin wrote a book a short time ago, bearing the ominous title of "After Hitler Stalin ?" * and carrying as heading to one of the chapters : "Lost Balance." He is, of course, alluding to the European balance which England has always struggled to maintain, for which she fought and led others to fight. According to the writer this balance was lost already at the end of World War I : "To understand what happened we must realise four outstanding facts : first, there was no longer Austro-Hungary with whom Britain had blocked Russia's expansion into the Balkans ; secondly, the British, underrating the blood-letting France had undergone, over-estimated her strength ; thirdly, Germany, though potentially far superior to France, lay prostrate, disarmed, and in the throes of a devastating currency inflation ; fourthly, England, called by Beaconsfield an Asiatic Power, was afraid of Russia."

This was the case in 1919. Is it not also true for today ?

In 1919 an endeavour was made at Versailles to rescue the European balance. At that time, however, we had statesmen like Clemenceau, Lloyd George, Briand, Stresemann, and also Wilson, if you wish. A firm foundation for the European balance was laid in 1815, at the Congress of Vienna in Schoenbrunn Castle. At that time, Europe had two top-calibre statesmen : Metternich and Talleyrand.

And in the year 1948 ? There is no longer any balance, there do not seem to be any real statesmen left, there is not even a congress or a peace to give us courage and make us feel a little happier.

All that is left is aviation ! And this time even we ourselves can find nothing else to say but : Alas ! *EEH.*

* Robert Ingrim : "After Hitler Stalin ?" Published in 1946 by the Bruce Publishing Company, Milwaukee, U.S.A.

Does the Division into Spheres of Influence mean War?

"... Just as in 1939, mutual distrust clouds every exchange of speech. The same words are used to express opposite opinions ... Thus the desire for indivisible peace stays beyond the ability of the great powers ... The principle of dividing the world into spheres of influence—the same which led Hitler to triumph in 1938 in Munich and in 1939 in Moscow, the same which caused the War—is again darkening our horizons.

Such a division is a comprise at the cost of a third party ... It affords an inroad to all ambitions and dreams of hegemony.

THE DIVISION INTO SPERES OF INFLUENCE IS WAR ..."

"The Last Days of Europe"

A book completed in May, 1946, by exiled Rumanian ex-Foreign Minister Grigore Gafencu.

At the beginning of 1946, when Grigore Gafencu made public his 1939 memoirs—the failure of a diplomatic journey through Europe—the conception of spheres of influence was still a menace. Today ? It would be akin to burying one's head in the sand, to simply denying facts, if one refused to recognise that the world is divided into two great spheres of influence—a Western and an Eastern sphere.

Is Gafencu right in his opinion ? Does this division really signify war ? If it were to come tomorrow, it would no longer be a case of merely the "Last Days of Europe" ; it would concern the last days of our world.

We don't feel like sharing his fears, and still less like propagating them. It is not that we perceive in what one fondly calls "common sense," a sure remedy against such an unimaginable catastrophe. But we do perceive a difference between the 1938/39 situation and that prevailing now in 1948. Before the War, the exponent of spheres of influence, Hitler-Germany, was arming openly and secretly. In the domain of armament, Hitler enjoyed a sort of monopoly. Today, rearmament is going on openly, and above all in the United States. Openness has never caused any harm ; it has never caused a war. War has almost invariably been a fruit of secret diplomacy, the statecraft of yesterday.

With this in mind, let us now examine the reports on United States armament which the whole world was able to read between January 1st and March 1st, 1948.

They culminate in two theses : No price is too high to pay for peace ; and war—particularly with the U.S.A.—is bad business. This is one of the theses. The other ? The next war will be in the air. In the air, however, the supremacy now belongs, and will continue to belong, to the U.S.A.

In order to prove this, and to warn and give assurance to the best of our ability, we give here an analysis of the reports on armament emanating from Washington.

* * *

"SURVIVAL IN THE AIR AGE" : PUBLISHED ON JANUARY 1st, 1948.

"Survival in the Air Age" : no doubt as somewhat sensational title for the report which President Truman ordered his five-man temporary *Air Policy Commission* to draw up between June 18th and December 30th, 1947. Its contents were dealt with briefly in a former issue of our magazine. To reproduce every thought expressed in this impressive document of 40,000 words would be beyond the scope of this article ; but we shall endeavour to do justice to the considerable labours of the Commission under the chairmanship of Thomas K. Finletter, New York lawyer. Indeed, the Commission has worked with exemplary thoroughness : before reaching its conclusions it obtained oral and written statements from some 150 witnesses, representing the U.S. Army, Navy and Air Force, the aircraft industry, aeronautical research organisations, and the airline companies.

"Survival in the Air Age" is divided into five sections :

Section I. Air Power and the National Security.
Section II. Aircraft Manufacturing Industry.
Section III. Aeronautical Research and Development.
Section IV. Civil Aviation.
Section V. Government Organisation.

Each of these sections begins with a basic consideration of the specific problem, subsequently treats the national and international aspects of the problem, and ends with the Commission's recommendations.

The sentences below will serve to give the gist of the Air Policy Commission's report :

In the opinion of the Commission the United States entire military establishment must be built around the air arm.

A second-best air force, when war takes place, is almost as bad as none.

The new weapons which can be delivered through the air make it vital that we protect ourselves from attack by way of this new element.

Atomic weapons will not long remain our monopoly. There are other weapons of comparable destructiveness.

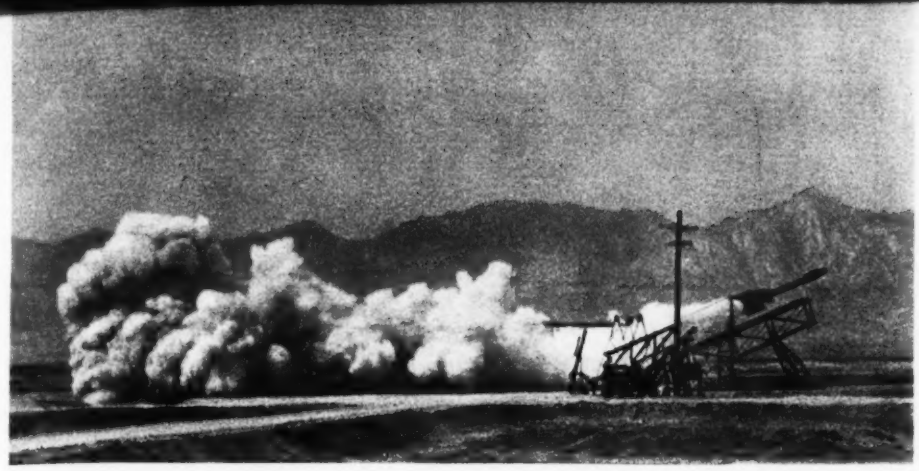
Mankind has not indulged in biological warfare on a large scale so far.

But the nations might be foolish enough to try it out.

SIMULTANEOUSLY, THE COMMISSION REACHED THE FOLLOWING CONCLUSIONS :

(1) It is impossible to know certainly when other nations will have atomic weapons, but it is proper to assume, for our present planning purposes, that other

ONE OF THE CRADLES OF AMERICAN AIR POWER : Lindbergh Field, San Diego, also Headquarters of Consolidated Vultee, Ryan, etc.



NEW GUIDED MISSILES : experiments by Aerojet Engineering Corp., California.

nations are not now producing such weapons in quantity.

(2) If an effective system for reviews of the strategic situation and for the adapting of our procurement and research and development policies to our strategic needs is established, it would be safe to assume, in making our plans for the next two years, that possibly hostile powers will not be producing atomic weapons in substantial quantities before the end of 1952.

(3) It would be an unreasonable risk, and therefore, a reckless course, to rely on other nations' not having atomic weapons in quantity by the end of 1952.

(4) There exist today no guided missile or electronically-controlled aircraft possessing a range adequate for a possible enemy to gain air supremacy over the U.S. mainland ; for this purpose a range of 5,000 miles would be necessary.

(5) But a possible enemy, and ourselves, could be in possession of such weapons by the end of 1952.

ON THE BASIS OF THESE CONSIDERATIONS THE COMMISSION DRAWS UP A PROGRAMME DIVIDING THE FUTURE INTO TWO PHASES :

Phase I extends from now until January 1st, 1953, this date being called A-day, representing the beginning of *Phase II* and the date by which the U.S.A. should have an air arm capable of dealing with a possible atomic attack on her mainland.

" THE VERY MINIMUM NUMBER OF INTERCEPTOR FIGHTERS NECESSARY FOR HOME DEFENCES ": a formation of Lockheed "Shooting Star" jet fighters.

The above paragraphs outline the plans advised by the President's Commission, which represents the first investigation body to submit a report on America's rearmament in the air.

* * *

The planning is followed by the figures :
Present strength of the U.S. Air Force :

Personnel : 337,000 uniformed and 125,000 civilian.

Equipment : 55 groups—10,800 aircraft, including about 580 heavy bombers and 2,300 fighters ; backed up by a reserve of about 12,800 World War II aircraft which will be unusable in two or three years' time.

Conclusion : Inadequate for Phase I, but hopelessly wanting in respect of Phase II.

Recommended : Immediate increase to a minimum force of 12,400 modern aircraft, equipping an Air Force consisting of 70 combat groups, and 22 special squadrons, supplemented by 27 National Guard groups and 34 groups of Air Reserve—all, with the exception of the Air Reserve, being equipped, trained and ready for immediate action in the event of war.

The 70 groups should include the very minimum number of interceptor fighters necessary for home defences ; and their effectiveness should be almost entirely dependent upon having a satisfactory radar early-warning system and adequate ground and air defensive missiles. No plans should be made in derogation of the striking counter offensive air arm in being.

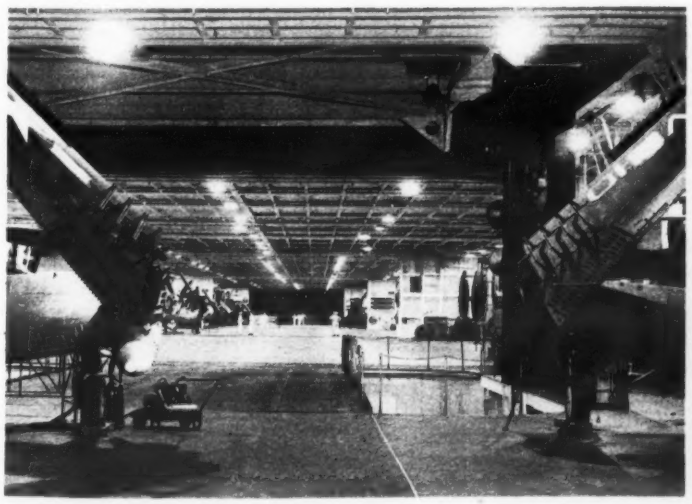
The 70 groups should provide only 700 very heavy bombers for the strategic bombing of enemy targets. This force seems minute against the 14,000 bombers committed to combat by the U.S.A. and Great Britain in the European war theatre ; and only by using the very best equipment and the latest techniques will so small a force be able to carry an effective war to the enemy.

Apart from the total fleet, an adequate reserve, now estimated at 8,100 aircraft, must be created ; and maintained in a proper state of modernisation since planes in storage become obsolescent.

NEW MISSION FOR THE NAVY :

Changed conditions, in as much as the U.S. Navy will not be called upon to engage an enemy surface navy since none exists and it is questionable whether any will be built by a foreign power within the next decade.

"THE CARRIER HAS BECOME THE MAJOR SHIP": on the right is a group of escort carriers ; the left hand photo shows the inside of a new big carrier, the "Franklin D. Roosevelt" of 45,000 tons.



During Phase I the Navy, in the event of war, must be able to occupy or secure advanced bases, and to prevent the enemy from occupying his own bases.

Continued organisation into two fleets—the Pacific Fleet and the Atlantic Fleet, each composed of several carriers and its supporting ships.

The new strategy of the Navy is air power. The carrier has become the major ship—the battleship is now of secondary importance.

The report then lists general figures for expanding the Navy Air Arm, for increasing its budget expenditures as well as that of the Air Force—beginning straight away in the calendar year 1948.

The *Joint Chiefs of Staff* under the Secretary of Defence is criticised favourably.

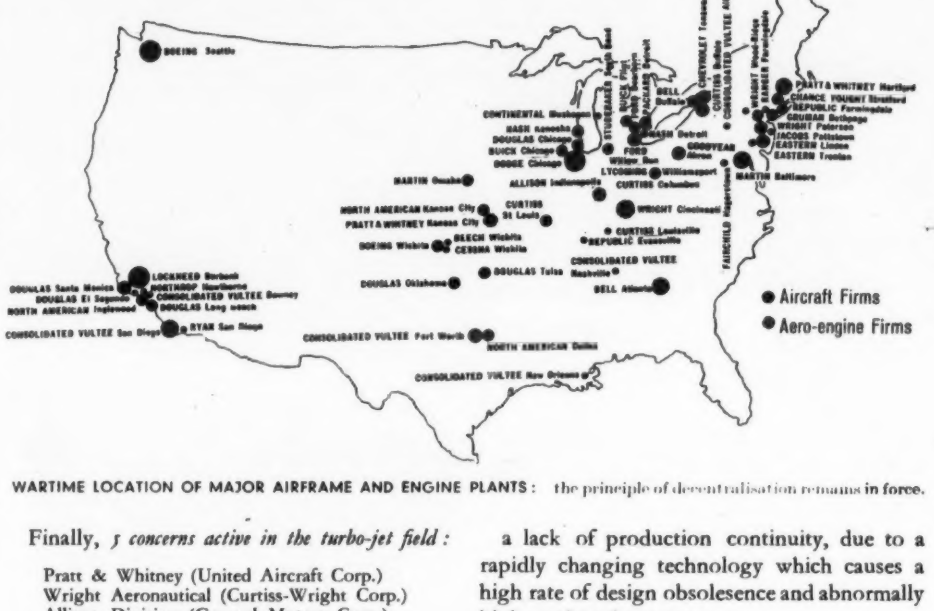
The consolidation of the Air Force's and Navy's transport services, recommended by the Commission, has already been accomplished. The Air Transport Command (ATC) and the Navy Air Transport Service (NATS) have already been fused to form the *Military Air Transport Service (MATS)*. In the fiscal year 1947 the two services together had 450 aircraft and about 28,300 personnel. The new consolidated organisation, in the opinion of the Commission, should be modernised and expanded.

* * *

The Aircraft Manufacturing Industry :

Bell Aircraft Corp.
Boeing Airplane Co.
Consolidated Vultee Aircraft Corp.
Curtiss-Wright Corp.
Douglas Aircraft Co., Inc.
Fairchild Engine & Airplane Corp.
Grumman Aircraft Engineering Corp.
Lockheed Aircraft Corp.
The Glenn L. Martin Co.
McDonnell Aircraft Corp.
North American Aviation, Inc.
Northrop Aircraft, Inc.
Republic Aviation Corp.
Ryan Aeronautical Co.
United Aircraft Corp.

Furthermore, *9 major makers of personal and small commercial planes.*



WARTIME LOCATION OF MAJOR AIRFRAME AND ENGINE PLANTS : the principle of decentralisation remains in force.

Finally, *5 concerns active in the turbo-jet field :*

Pratt & Whitney (United Aircraft Corp.)
Wright Aeronautical (Curtiss-Wright Corp.)
Allison Division (General Motors Corp.)
General Electric Co.
Westinghouse Co.

To these come the *manufacturers of components.*

At the time the report was submitted the military procurement was at the rate of about 21,000,000 lbs. of airframe weight annually. This should be increased by contracts for an additional 13,000,000 lbs. during the calendar year 1948, and for 22,000,000 lbs. in 1949 more than in 1948.

The *financial difficulties harassing the aircraft industry* as a result of the last two years of readjustment from war to peace conditions, are investigated and taken into account. Some of them are :-

a product that is, almost indivisibly, a weapon of war and a carrier of commerce ;

a market with but one major customer, the Government, which purchases 80 to 90 per cent. of its entire output ;

a violently fluctuating demand, due to uncertainty of requirements of its major customer ;

a lack of production continuity, due to a rapidly changing technology which causes a high rate of design obsolesence and abnormally high engineering costs ;

an extremely long design-manufacturing cycle ;

an organisation in excess of present requirements.

How can the State, which has to keep this industry alive, master this situation ? It cannot guarantee profits. However, it can and should create an atmosphere as conducive as possible to profitable operations throughout the aircraft manufacturing industry.

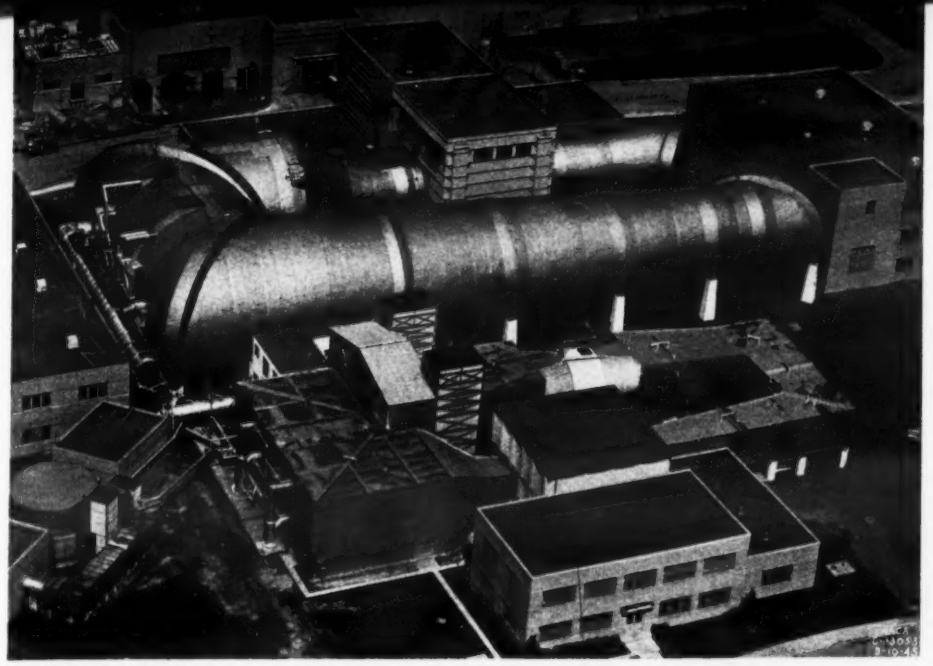
The law for decentralisation and dispersion of airframe and engine plants, urged since 1934 and only enforced during the War, must remain in force.

* * *

The section on *Aeronautical Research and Development* is based on the testimonies of numerous witnesses, none of which presented a contrary view to the one that : "whatever money is spent for the purpose can be looked upon as a vital form of national insurance, a direct contribution towards maintaining our leadership in the air."

During the War the U.S.A. concentrated on the development of existing types of aircraft for production, and practically abandoned fundamental research in the aeronautical sciences. Allusion is also made to the fact that abroad—in befriended France, for instance—new aeronautical research programmes are being fostered energetically. (Did the authors of this report know, or did they not want to know, that the "large group of high-speed wind tunnels somewhere in the French Alps" in reality represent a kind of gift from the Americans to the French ? They were formally located in the Austrian Alps and were being completed by the Germans shortly before the War ended.) Incidentally, it is here that the report makes its only allusion to what is going on in Russia : "There is published evidence that aeronautical research and development programmes on a very large scale are under way in Russia."

"700 VERY HEAVY BOMBERS" : the atomic era calls for range and speed as the main characteristics of a bomber.



AERONAUTICAL RESEARCH : one of NACA's many test installations, at Cleveland, Ohio.

Let us be brief, briefer than this part of the document. For the calendar year 1948, about $312,000,000 have been earmarked for research and development. This sum will not remain unchanged. The U.S. National Advisory Committee for Aeronautics is the leading organisation of its kind in the world, and will probably retain its place for many years to come.

* * *

It is surprising to see that this report on armament devotes almost a fifth of its contents to a subject which is only indirectly concerned with armament : *Civil Aviation.* It brings us back to the problem which caused the Geneva Disarmament Conference of 1934 to run on the rocks : is a transport aeroplane a weapon or not ?

Fortunately, the recognition has now seeped through that a commercial aeroplane is only indirectly a weapon, just as a railway coach or a ship is. Without transportation, a war cannot be fought today, least of all a war overseas without transport aircraft.

It is recalled anew that U.S. civil aviation has been working at a loss since 1946. It is admitted frankly that, in this respect, the fault must be attributed not only to the airline companies, but also to the U.S. Government. Both were far too optimistic. An investigation is made as to how civil air transport can be helped, and placed on a healthy basis.

The recommendations are not new, but this time there is a likelihood of their finding fulfilment : carriage of all first-class mail by air ; introduction of domestic and international air parcel deliveries (already decided on for international airmail—Ed.) ; increase of the airmail rates, i. e., of the Government subsidies ; trying out of new aircraft types for cargo transportation—eventually in military conditions, and thus at the expense of the Government ; more rapid and extensive expansion of ground facilities in order to bring about an increase in regularity and safety.

Because civil aviation has now assumed a rôle of such importance, and because its significance as an auxiliary arm can no longer be ignored, it is recommended that it be granted an independent status : the post of a *Secretary of Civil Aviation* should be created. Incidentally, it would seem that this post is more concerned with that of an Under-Secretary of State for Civil Aviation, as the holder thereof would still be responsible to the Secretary of Commerce.

* * *

"NATIONAL AVIATION POLICY" : PUBLISHED ON MARCH 1st, 1948.

A business-like title for a business-like report which the *Congressional Aviation Policy Board* began on June 30th, 1947, and published on March 1st, 1948. In theory, the President's Air Policy Commission and the Congressional Aviation Policy Board were to have worked separately. We do not know whether President Truman's five nominees at any time conferred with the nineteen members of Congress under the Chairmanship of Senator Owen Brewster ; but at all events the two reports reveal unmistakeable points in common as regards their observations and aims. There is no need to criticise them—both documents are well worth reading.

The document prepared by the President's Commission presents basic considerations and "urges action." The second document ? There is no question of urging action—it concerns what is akin to decisions for execution.

And since, after all, the primary requisite to all these plans is first to dig deeply into the American taxpayers' pockets, "in order that we may survive the air age," the 19-man Board begins its report on a doleful note :

"Within two years after cessation of hostilities in World War II, general concern over national security, along with threatened bankruptcy of the aircraft industry and civil air carriers of the United States, indicated necessity for review of national aviation policy by the Congress."

The 92 paragraphs of this 9,000-word report are divided into five headings, as follows :

Part I : Combat Aviation.
Part II : Air Transport.
Part III : Aircraft Manufacturing.
Part IV : Research and Development.
Part V : Government Organisation.

Both reports coincide as regards their division. Let us compare the conclusions.

To begin with, the military is hauled over the coals. The Board severely criticises the Joint Chiefs of Staff in not having elaborated the requirements of the air services in accordance with a unified plan of action, despite repeated requests. Moreover, there is no present indication that such a plan is in process of determination. (The Editor would point out : This is democracy !)

And as the Joint Chiefs of Staff did not seem to have been of much help, the Board set out to accomplish the task on its own. It was therefore necessary to accept the requirements put forward separately by the Air Force and the Navy.

CIVIL AVIATION WAS WELL REMEMBERED IN THE NEW PLANS : the terrain of New York's Idlewild project, the biggest airport in the world.

V3-4 APR 48 XUM

THE AIR SPACE OVER THE POLAR REGIONS : here is where the Eastern and Western spheres of influence meet.

In order to defend herself in "the age of atomic bombs, of radioactive dust, of bacteriological contamination and guided missiles," America must have air supremacy for the purpose of discouraging attack or carrying out retaliatory attack. In World War III there will be no time for mobilising. *Two alternative plans* are therefore offered, Plan A and Plan B (the report discussed earlier on spoke of Phase I and Phase II).

Plan A :

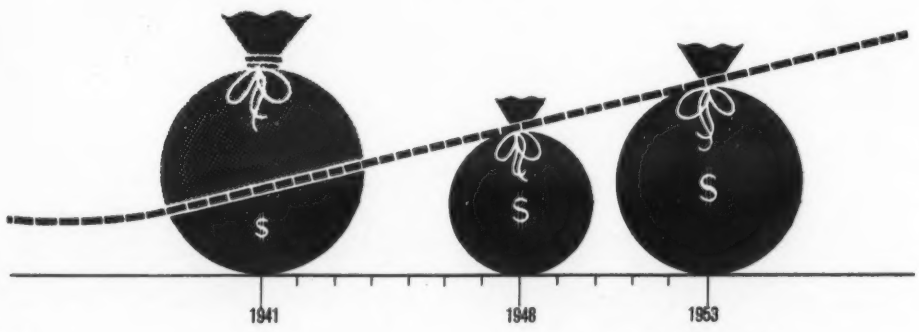
Prompt provision of 35,000 aircraft, to be built by 1953. These divide into 20,500 for the 70 Air Force Groups, and 14,500 for the Navy Air Arm.

During the 1947-48 fiscal year the Air Force is procuring only 13,000,000 airframe pounds, and the Navy Air Arm only 8,000,000 pounds.

At the level-off period in 1953, the Air Force would thereafter require an annual procurement of 86,000,000 airframe pounds, and the Navy one of 25,000,000 pounds.

Plan A, as above, would provide the initial strength necessary to mount promptly a sustained and successful air offensive against a major enemy.

WHAT DOES IT COST TO REARM IN THE AIR?
1941 : $11,000,000,000 for Army, Navy and Air Force.
1948 : $3,380,000,000 for the Air Force alone.
1953 : $10,000,000,000 for the Air Force alone.



Plan B :

Likewise a prompt provision of 35,000 aircraft.

Postponement of the level-off date until 1954 ; but without reserve aircraft.

Plan B, as above, would enable the U.S.A. to hold back an enemy, i e., "to prevent the loss of war upon the outset of hostilities."

THE COSTS :

Plan A would amount to $3,830,000,000 during 1948, $6,950,000,000 during 1950, $8,580,000,000 during 1951, and approximately $10,000,000,000 during 1953.

For Plan B the same appropriations would be required for armament procurement in 1948, $6,510,000,000 in 1950, $7,920,000,000 in 1951, and "only $8,300,000,000" in 1953. Below, we shall endeavour to explain what these figures signify, notably for non-Americans.

On January 8th, 1941, President Roosevelt brought forward his 1942 "War Budget," although the U.S.A. had not declared war by that time. When the world read of the figures he proposed, it had misgivings about their authenticity. That U.S. Budget amounted, for everything, to $17,500,000,000, of which about $11,000,000,000 were to be allocated to the three Armed Services. *With these $11,000,000,000, million-man armies were prepared in 1941, gigantic fleets with new aircraft carriers were started on, the world's greatest aircraft manufacturing industry was built up, and a programme for producing 50,000 military aircraft annually was made possible*—which, as a matter of fact, produced 90,000 aircraft in 1944.

And today ? *This time nearly $10,000,000,000 are being proposed for Air Force procurement alone in 1953 !*

* * *

Now that readers are acquainted with Plans A and B, the figures on which they are based, and the whole tendency of American rearmament in the air, it seems absolutely essential to explain how strongly this armament will and must influence the aircraft industry, the airline business, and even U.S. commerce in its entirety, during the coming years. Everything that was urged by the President's Air Policy Commission is—we emphasise this again—repeated in the report by the Congressional Aviation Policy Board. Whether or not the figures differ a little in their magnitude, the *principle is the same.*

Which principle ?

No price is too high to pay for peace ; and a war with the U.S.A. still means bad business.

Does the division into spheres of influence mean war ? Not absolutely ! Not everybody wants to go broke...

EEH.

Flying Samaritans

In a settler's cottage a young nurse is seated before a table and working a pedal—not a sewing machine, or a spinning wheel, but a pedal dynamo—generating electric power so that she can establish radio contact with a doctor. A child lies ill and in great pain, and the parents are at their wits' end. The message comes through : "That will be all right," says the doctor, "I have to go to Waterloo Wells anyhow, so I can easily make the hop to your place." The "hop" is about 400 miles, thus about the distance from Paris to Genoa, and the doctor is an Australian "Flying Doctor," one of the winged samaritans who, working from seven main centres, carry help to every point of the Australian continent.

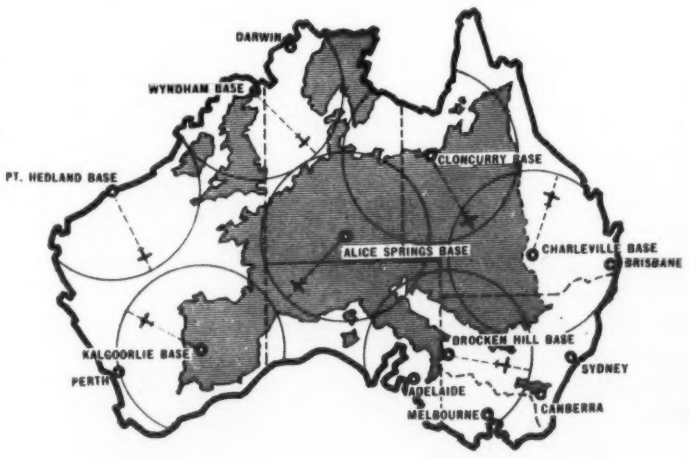
The Rev. Dr. John Flynn, O.B.E., pioneer of the Australian Flying Doctor Service. (Courtesy, League of Red Cross Societies)

A flying ambulance service of this sort, carrying doctors and medical supplies to outlying regions, and sick people back to central hospitals, could not have developed in a city like London, New York, or San Francisco, for instance. It is not intended for highly-industrialised and thickly-populated areas, but for reaching isolated outposts and difficultly-accessible regions denying the utilisation of any other type of transportation besides the aeroplane. It is therefore not surprising to find such a highly-developed "Flying Doctor" service in operation in the waste areas of Northwest and Central Australia.

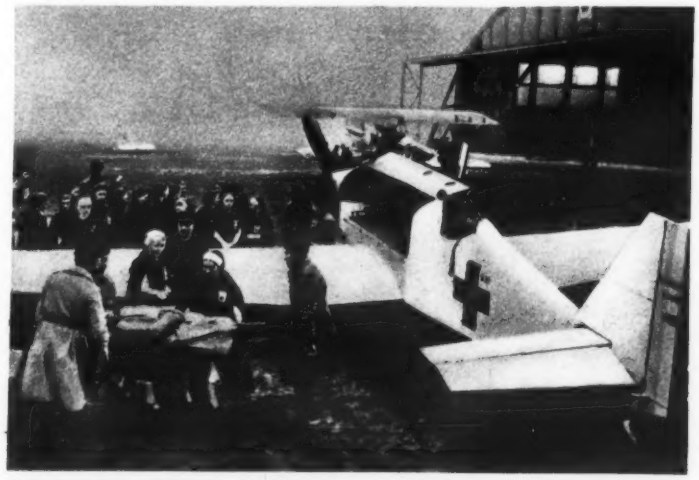
Everybody has read stories of Dr. Albert Schweizer and other heroic missionary-doctors who challenged the perils of Africa ; and whose worst enemy was not so much the diseases as the endless distances. The Rev. Dr. John Flynn, of the Australian Inland Mission, fought and won a thirty-year war against miles, sand and lack of communications. If—as it happened not so many years ago in Perth, Australia—a doctor receives a six-week-old letter requesting his assistance in giving birth to a child, then he can't very well help asking himself whether he ought to lend his assistance to the next or rather the next but one generation. As it happened, the case turned out well. The "Flying Doctor" managed to arrive in time. But how often has a case of infantile paralysis, food poisoning, or appendicitis ended tragically, just because help did not arrive hours late, but days, or even weeks ?

Doctors grow wings.

The Rev. Dr. John Flynn used to drive through the Australian wilds in a 1-ton antediluvian lorry, until the meteoric development of aviation during World War I gave him the idea of starting a flying



The seven regions safeguarded by the Australian Flying Doctor Service comprise an area much greater than all Europe. (Courtesy, League of Red Cross Societies)



The women-founders of the French airborne medical service, IPSA (Infirmières, Pilotes, Secouristes de l'Air), paid for their flying and medical training from their own pockets. (Courtesy, League of Red Cross Societies)

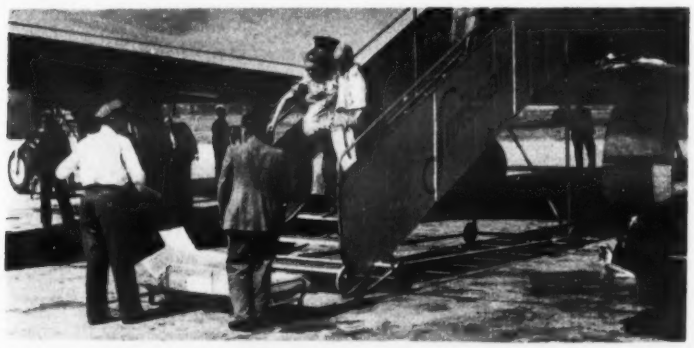
Medical supplies sent to the Malay Peninsula by the International Committee of the Red Cross. These supplies were requested in July, 1947, by radio, and promptly forwarded by air. (Courtesy, International Committee of the Red Cross).

The contents of these crates ought to do the trick :

1,260 lbs. of Sulfanilamide	1 crate of Pantocaine
600,000 tablets of Sulfathiazole	500,000 tablets of Sulfapyridine
1,000,000 tablets of Sulfaguanadine	3 crates of surgical instruments,
10,000 ampoules of Omnopan	hypodermic syringes and needles.

G.I.'s taken ill in Germany are flown by Air Transport Command to the U.S.A. This photo shows them being loaded into ambulances at Gander, Newfoundland.

By flying stretcher over the Atlantic, by ambulance to hospital and, as soon as possible, by Shanks's pony home.



A patient being unloaded at Cointrin airport, Geneva, and taken off in an ambulance.

ambulance service. The first half of the problem could therefore have been solved ; but it took another ten years for the airborne medical service to materialise, for there was no means at all for carrying messages quickly enough. The part played here by radio development is a story in itself.

The first service began in 1928. A radio station was installed at Cloncurry, Queensland, and a transport agreement was simultaneously concluded between the Australian Inland Mission and the Queensland & Northern Territory Aerial Services, Ltd. (today known as Qantas Empire Airways, Ltd.). During that year fifty flights were carried out from the Cloncurry base, and 255 patients visited or brought to hospital. The average cost of each flight amounted to nearly £80. And these costs became the Enemy No. 1 of the "Flying Doctor Service." The Commonwealth Government fully recognised the national significance of the undertaking, and its inestimable value to the settlers, but couldn't see its way to granting more than £5,000 annually. There was no choice but to appeal for public charity.

The scheme was a success. Today, Australia has seven central bases : Port Hedland and Wyndham in the West, Cloncurry and Charleville in the Northeast, Kalgoolie and Broken Hill in the South, Alice Springs in the centre of the continent. The areas marked out around these bases have radii of only 400 miles, so that, theoretically, certain regions cannot be reached. In practice, however, aeroplanes have greater ranges than this. And radio communications are available in every point of the Commonwealth, and there is a dense network of receiver-transmitters, so-called Transceivers, worked by pedal generators. In this way the settler and his family can live, in hardship still, but in security.

A similar service exists in Canada, where it is very highly developed ; and in Soviet Russia, where flying medical services were doubled during 1947. First-aid posts, using ambulance aircraft, are to be erected over the entire Soviet territory during 1948.

Free ambulance service.

As in Australia, the flying medical services in the European countries were also developed thanks to the efforts of generous private initiative.

It is understandable that large countries with wide and partly uninhabited areas have organised such services. But how come that a small country like Denmark, for instance, has conceived the same notion ? The answer is not difficult to give. This small country consists of an archipelago of nearly 500 small islands, of which 111 are all the same permanently inhabited. Despite the erection of modern bridges and the development of a well-organised marine transportation system, many of these islands, notably the very small ones, are completely isolated by ice packs in winter. The only way of visiting sick people and bringing them to hospital is by flying.

KZ IV with lateral opening for stretcher.

Denmark's flying ambulance service, run by the Zone Company, was started on April 20th, 1939. Apart from the setbacks caused by the German occupation, it has developed satisfactorily. Today the company has seven ambulance aircraft, three of which are twin-engined.

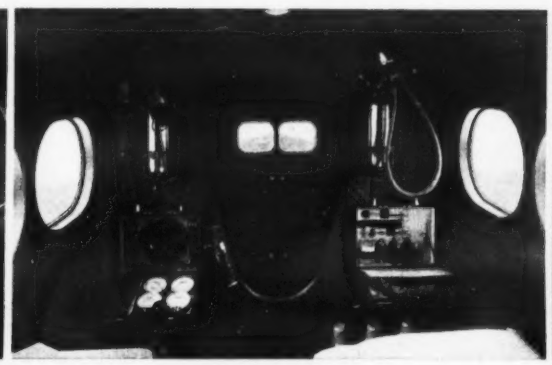
One of the main contributory factors to the excellent organisation of Danish flying ambulance services is the careful and continuous control which the Zone pilots maintain over a great number of emergency landing areas on all the Danish islands. Special attention is paid to modifications of an agricultural nature : new crops planted, fences erected, dams, dykes, and any terrain features which pilots are apt to rely on for reference ; for unexpected changes in this respect could very well lend to unpleasant surprises. In this way the Zone pilots have been able to organise a network of over 150 landing fields, and all the islands which have to rely on the aeroplane in certain seasons—i. e. practically 99 per cent. of the Danish island population—can now be reached by the flying medical service.

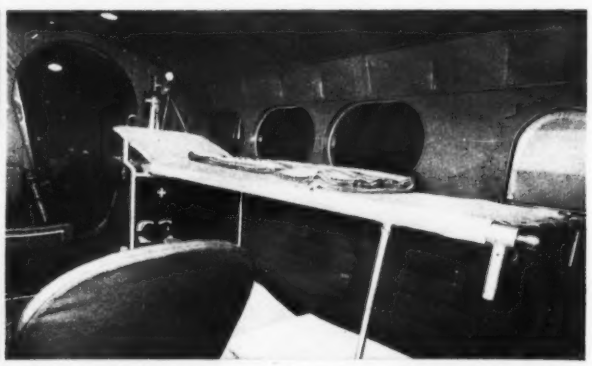
* * *

Like the Australian "Flying Doctor" service, the Danish organisation is almost entirely dependent on private assistance. In general, the Danish airborne ambulances are run by the so-called "Rescue Corps," a private organisation which the Danish population can apply to for help in the event of any accident or catastrophe — fire, flood, shipwreck, etc., and which supplies aid in the form of technical material and trained helpers. Financially, they might be compared with any insurance concern. Against payment of an annual premium, every household and every commercial untertaking in Denmark can apply to the Rescue Corps. Alongside this, however, the charitable character of the flying ambulance service is retained ; and every one has the right to free transportation by air to the nearest hospital.

Here is a task for every country — a task really serving a peaceful purpose in our war-threatened age. The Italian, Greek or Turkish island-dwellers are just as much in need of a flying ambulance service as the inhabitants of countries where such services are already organised. How about using just a small percentage of our current defence budgets ?

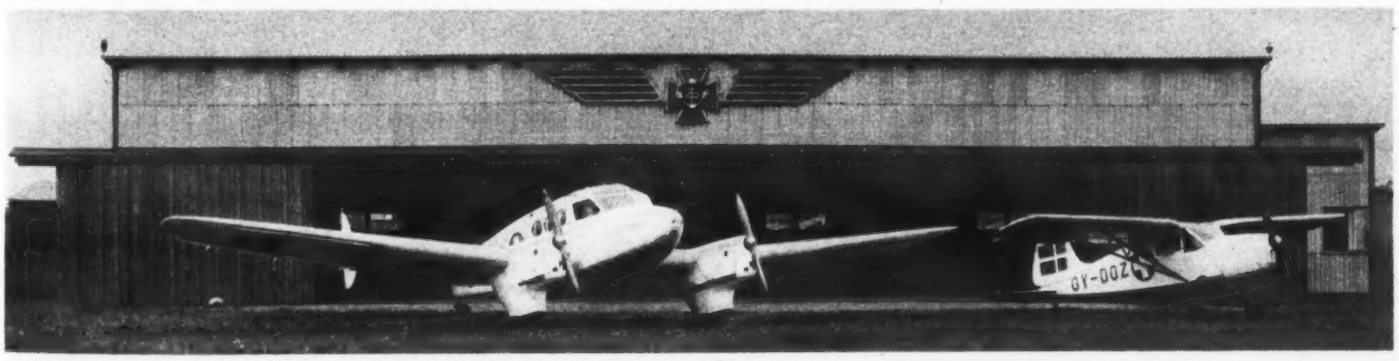
Inner layout of a "Monospar," showing stretcher and containers for first aid.





The twin-engined KZ IV of the Zone Company can carry two stretchers, oxygen equipment and an "iron lung" for cases of infantile paralysis.

Hangar belonging to the Danish air ambulance company, Zone. On the left is a twin-engined "Monospar" which, in addition to pilot and radio operator, can take a stretcher patient, attendant, doctor and nurse on board.



Back to the Postchaise!

Since our story concerns something that happened in Switzerland, we shall begin by mentioning one of the internationally best-known Swiss. Not William Tell, and not even Gottfried Keller—the man we have in mind is none other than Grock, the unforgettable clown of clowns, who rocked the world with laughter a few decades ago.

And the story you are about to hear is one that would have caused Grock to emit a very sincere and sonorous "You don't say!"

* * *

Highly-perfected press services are busily feeding a confused public with tales of the revolutionary achievements of aviation—how much is to be gained from entrusting one's person, one's business and love letters, and one's urgent or valuable despatches to the aeroplane. And gullible as the majority of the public is, there are indeed lots of people who really do all this.

The poor things !

* * *

We are witnesses to civil aviation's battle for existence. Airline companies are training crews, buying new aeroplanes, squabbling with their national aviation authorities in order that the latter may allocate greater sums for building and expanding airports, providing radio facilities and all the other safety measures which are at present desirable in the interest of commercial air transport. The airline executives are wracking their brains for ways of bringing the rates down and making the aeroplane a real boon to mankind. They launch gigantic publicity campaigns, keep up large fleets of coaches for carrying their passengers between airports and city centres, serve free meals on board their airliners, organise special flights. Tales of the Thousand and One Nights.

And then there are about 4,500 officials agencies of the International Air Transport Association, which are always ready to help passengers and freight contractors, and which pocket fair-sized percentages for their labours.

As you see, the airline business is by no means small. It is a huge and very intricate machine, and one which is growing very quickly.

* * *

You don't say ! One is apt to raise one's eyebrows and—despite the Marshall Plan and Molotov and Gottwald and Benes and Franco and Anna Pauker—to entertain misgivings as to whether there is still any element of sanity left in this world.

Open your eyes and ears to some of the things going on in the Air Age, in the age of UNO, UNESCO, ICAO, IATA and all the other international conferences—and you'll find yourself emulating Grock even in your sleep.

* * *

A Swiss aviator received a Christmas present from friends in England. It wasn't a gold cigarette case or jewellery for his wife, nor was it a Rolls-Royce or a Bentley. To tell the truth, it was nothing but a toy, a small model aeroplane.

In order that it should reach him in time, his English friends sent it by British European Airways, everything being planned that it should travel from London to Berne in the shortest possible time. It was carefully packed in a wooden box about eight inches wide, twelve inches long and six inches high, weighing approximately six pounds.

We now have to insert a small lesson in geography. There is a daily service by air from London to Zurich, and the distance is roughly 480 miles. Meanwhile, no regular air service is flown between Zurich and Berne, which are separated by no more than 60 miles as the crow flies ; but the Swiss Federal Railways provide frequent day and night connections. Swissair coaches arrive at the railway station in Zurich every few minutes, and in any case it only takes about 15 minutes to get there from the airport. Berne's railway station is right in the centre of the town.

Let us get this quite clear. A small package sent by air freight, which arrives at Zurich's Dübendorf airport, and has to be forwarded to Berne, of course has to be reloaded : from the aeroplane to the railway train, which is not a very complicated operation. Now there is nothing unusual about this, since the majority of packages sent by post have to be reloaded at some point of the journey. Not every destination is located on a trunk-line, and packages aren't able to walk home by themselves. For this purpose we have railways and postmen, and we pay for these services.

* * *

Listen to all that happened to a small parcel sent about 550 miles by an Englishman in London to a Swiss in Berne.

The export licence made out in London is dated November 4th, 1947. The customs clearance form delivered to the Swiss transport company weighed down with the responsibility of handling six pounds of freight, is dated December 17th.

Between the Christmas goodwill of the sender and the joy of the receiver are : about 550 miles on the one hand, and about six weeks on the other... You don't say !

At all events the parcel first arrived by air in Zurich, where it was taken over by a firm specialising in transportation between England and Switzerland. This firm handed it over to the post office and sent its bill on December 20th, 1947.

The amazing part of the story is contained in the invoice for a "model aircraft in wooden box weighing six pounds" :

Tax (Where don't we find taxes ?)	Frs. 4.05
Sales tax (We're used to that, too)	Frs. 5.40
Thus to the Government	Frs. 9.45

But now ! Just look at all the items a six-pound wooden box can contain :

Transport at Dübendorf (It's about 100 yards from the plane to the administration building)	Frs. 1.25
Customs formalities, declaration and re-packing (obviously a model aircraft like this one needs specialised handling)	Frs. 3.00
Tax receipt (Clerks have to live, too)	Frs. 0.75
Telephone to Dübendorf (This, of course, is most essential !)	Frs. 0.60
Postage Dübendorf—Berne and... delivery (It is to be hoped that the messenger didn't overstrain himself delivering 3 lbs. to the Post Office)	Frs. 1.40
Seal and postage, registration (Postage was already paid for—but who cares, anyhow !)	Frs. 1.50
	Frs. 8.50

Let's recapitulate :

At the beginning of last November an Englishman sent a small present, worth very little in money value, to his Swiss friend resident in Berne. He paid for it to go by air freight from London to Zurich and by surface mail, at the receiver's cost, from Zurich to Berne.

The receiver has no option but to stump up Frs. 9.25 (over $2 or 10/-) for customs and taxes.

The transport company, on the other hand, has the impudence to charge another Frs. 8.50 for handling this small parcel, which amounts to almost as much as the official expenses paid to the Government.

Viewed from the traffic standpoint, it is nothing less than a scandal.

* * *

And now consider what useful purpose is attained by having things sent by air freight—under the present conditions imposed by surface transport companies. Only one comes to mind : to enrich the said transport companies.

Meanwhile, however, we have two suggestions to make :

The first of these is that airline companies ought to compel surface transport companies to respect maximum tariffs, this in order that the public may be encouraged to use air freight instead of being scared of it.

The other suggestion is simpler. If the airline companies cannot, or will not, negotiate with the surface transport companies, then they should throw up the idea of air freight altogether.

And, as we said at the beginning—back to the postchaise !

EEH.

The Bomb is Not Retiring — Yet

It would be a fallacy to suppose that the "ordinary" large-calibre bomb has definitely retired in favour of the atomic bomb. Judging from a recent U.S. Air Force release, it looks as though the efforts to develop the orthodox bomb are being doubled.

At its Muroc base in California, the U.S. Air Force test-dropped a 42,000-lb. bomb for the Army Ordnance Department. The largest bomb previously dropped from an aeroplane weighed 25,000 lbs.

A weight of 42,000 lbs. is quite a strain on the imagination. The average man weighs 150 lbs. A company of infantry usually includes 120 men. The weight of the new bomb is therefore about equal to the weight of two companies of infantry in battle equipment.

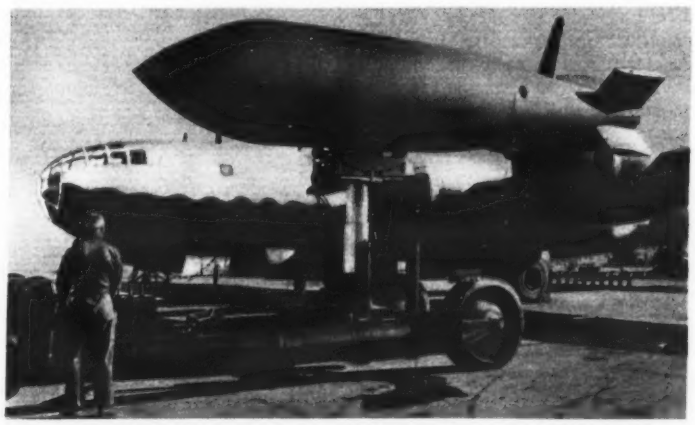
The aircraft used was a B-29 "Superfortress," which Boeing's Wichita Division modified for the test. After a portion of the fuselage had been cut away under the wing, and the rear bomb-bay doors removed entirely, it was still necessary to cut away the front bomb-bay doors to allow the nose of the bomb to protrude. Measuring four and a half feet in diameter and 26 ft. 10 ins. in length, about half the missile hangs below the normal surface of the aircraft.

A series of approximately twelve test-drops with "dud" bombs is slated before explosive ones are used, and it also planned to use a six-engined Consolidated-Vultee B-36, the U.S.A.F.'s largest bomber, for some of the tests. The purpose is to obtain flight data on the bomb's trajectory, and also on the aircraft's behaviour after the release. The results are to be forwarded to the Ordnance Ballistics Research Laboratories at the Aberdeen, Maryland, Proving Ground, and are to aid in the development of other bombs of this size.

The new big bomb, known as a general-purpose bomb, seems to have a good chance of not being ousted by the parvenue atomic monster. The official release states :

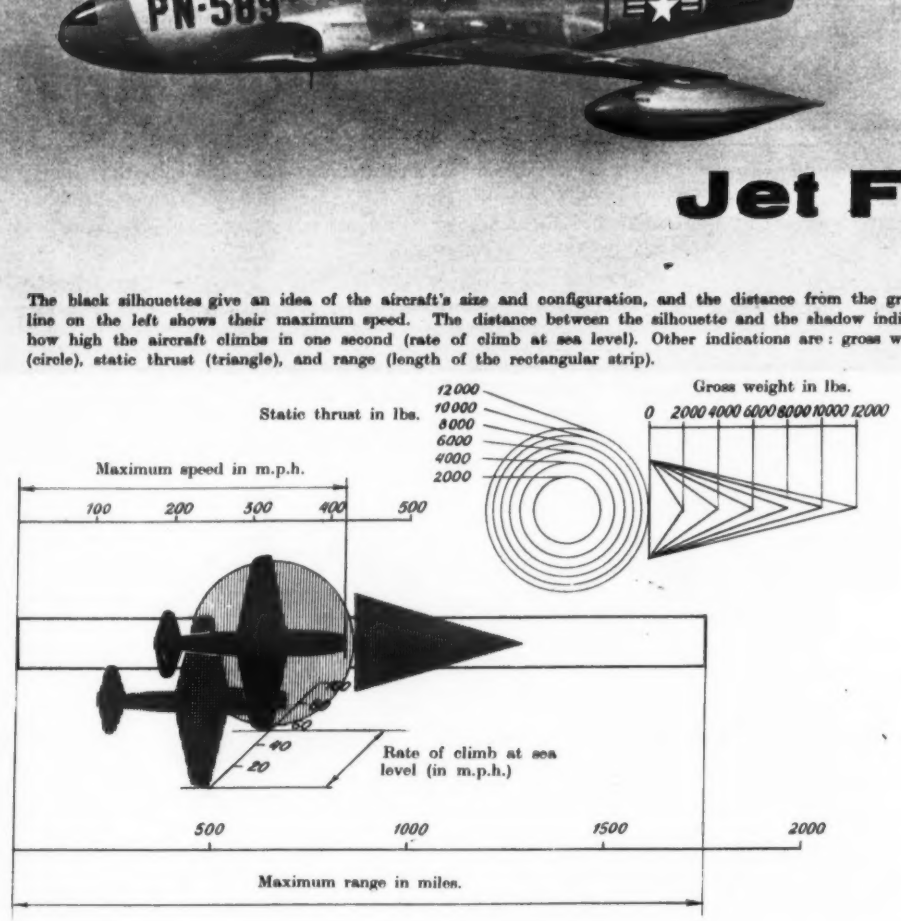
> "While lacking the destructive power of atomic missiles, the 42,000-lb. bomb has an advantage in that it leaves no radio-activity which might deny use of a captured area to the attacking force."

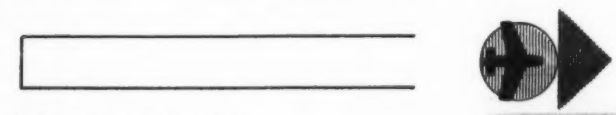
So what is there to be scared about ?



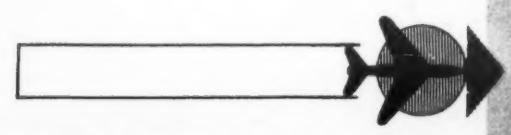
Jet Fighter 1948

The black silhouettes give an idea of the aircraft's size and configuration, and the distance from the ground line on the left shows their maximum speed. The distance between the silhouette and the shadow indicates how high the aircraft climbs in one second (rate of climb at sea level). Other indications are : gross weight (circle), static thrust (triangle), and range (length of the rectangular strip).

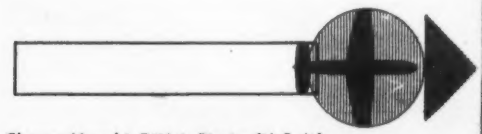




McDonnell XP-85 (U. S. A.)



Arsenal VG 70 (France)



Chance-Vought F6U-1 Pirate (U. S. A.)

The following review is a continuation of our series of articles on aircraft types at present in service, in line production, or being tested, which began in last month's issue (pages 136-140) with a summary of the latest piston-engined fighter aeroplanes.

Five hundred miles per hour is the speed limit which, for fighter aeroplanes, sharply divides the utilisation range of the jet engine from that of the reciprocating engine. Whereas it could be observed in the preceding article that not a single piston-engined fighter is capable of this speed of 500 m.p.h., it will be seen from the present account that all the existing jet-propelled fighters, with the exception of very few and already obsolete types, attain maximum speeds in excess of 500 m.p.h.

As we have seen, the latest piston-engined fighter aeroplanes are still only compromise solutions ; apart from making them more or less suitable for air duels as such, the designers have also pursued their efforts in the direction of range and ability to carry auxiliary armament. "Pure" fighter aeroplanes, on the other hand, must attain more than the 500 m.p.h. mentioned above — which they cannot do without jet propulsion.

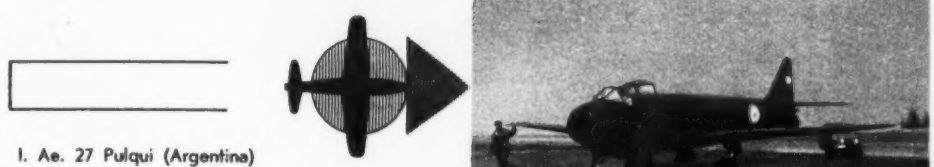
Summaries of the kind presented here are not intended to be catalogues of aircraft types, but above all a handy means of comparing the many existing aircraft from the standpoint of their dimensions, weights and performance, to show the relations between their particular operational purposes, and

thereby to present them in a clear and comprehensive manner. In the last issue, for instance, it was possible to divide the piston-engined fighters into characteristic groups according to their weight: light types of fairly old design, torpedo-fighters, long-range fighters, and so forth. Meanwhile, how can we speak of small or large aircraft in the case of the jet fighters listed here, if of nearly thirty types only three feature a span of less than 36 ft. and only three a span of more than 43 ft.; of light or heavy types, if the normal gross weight — a rather wide term — lies between 9,000 and 14,000 lbs. for the large majority; of slow types if every one represents an endeavour to come as close as possible to sonic speed; or from different operational purposes if nearly every one of them represents a pure fighter aeroplane for which range plays a minor rôle? The only alternative way of grouping them is, therefore, to draw attention to one or two types which, somehow or other, are "not quite in line."

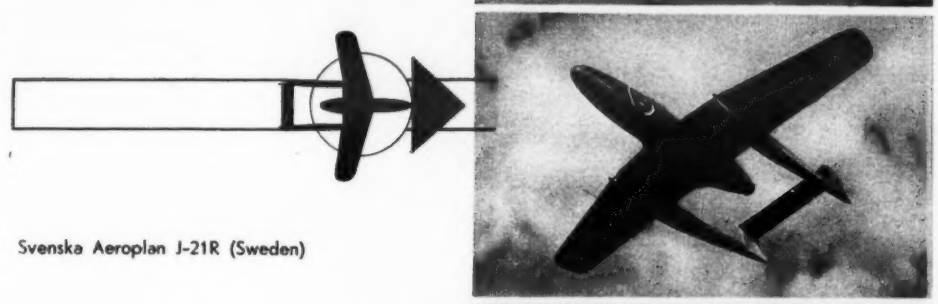
As surprising as it may sound, these are none other than the twin-engined designs. The early types had to be equipped with rather low-power engines (of 2,000 lbs. thrust and less), as nothing else was available, so that they frequently had to be fitted with two units. But because present-day jet engines are quite powerful enough to propel a single-seater at near to sonic speed, it is not often that we find twin-engined jet fighters among the latest designs. Among these is the Gloster "Meteor" which, representing the first jet fighter to be put into production, in reality also belongs to the older types but which, thanks to continual development, is still today one of the most powerful and above all fastest-climbing fighters. Then there is the McDonnell "Banshee" and the Saro fighter flying-boat; and finally we have an aircraft which would have been a monster if fitted with piston engines: a four-engined two-seater, the Curtiss XP-87.

As regards gross weight—according to which the types are ordered in the graphic presentations and in the table on the next page—and dimensions, the McDonnell XP-85 experimental type is revealed to be the smallest and lightest jet fighter. There is a rather special reason for this, since it is the only aircraft which is not designed for operation from the ground or from aircraft carriers, but for being launched from other aircraft as a defence fighter. There is, therefore, no heavy and bulky undercarriage, and no worry about take-off and landing runs. The small dimensions and a power plant developing sufficient thrust even for a medium-sized fighter, lead one to expect extremely high speed and degree of manoeuvrability, and perhaps even tactical superiority over ordinary fighters.

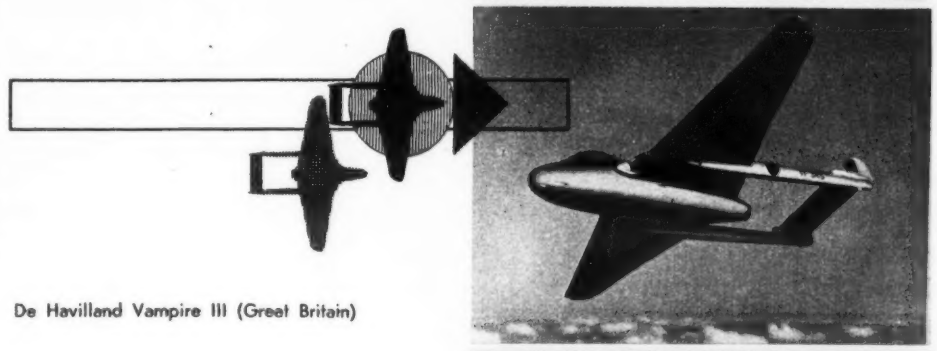
The second smallest jet fighter, according to the list, is the VG 70 developed by the French Arsenal aircraft concern, of which the prototype was on show at the 1946 Paris Salon and is now undergoing its flight tests. It seems always to have been a practice in France to try to develop a specially small and light fighter aircraft every few years,



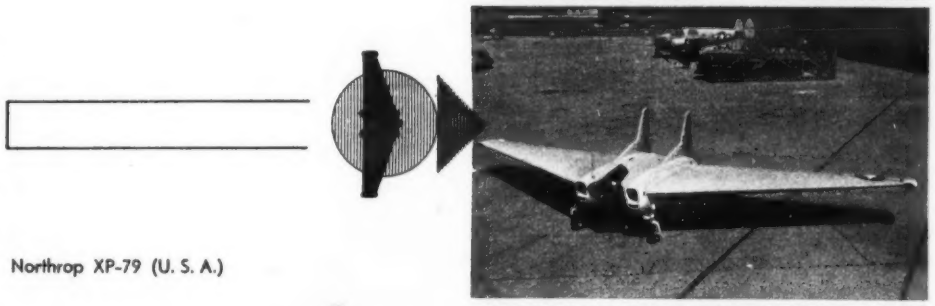
I. Ae. 27 Pulqui (Argentina)



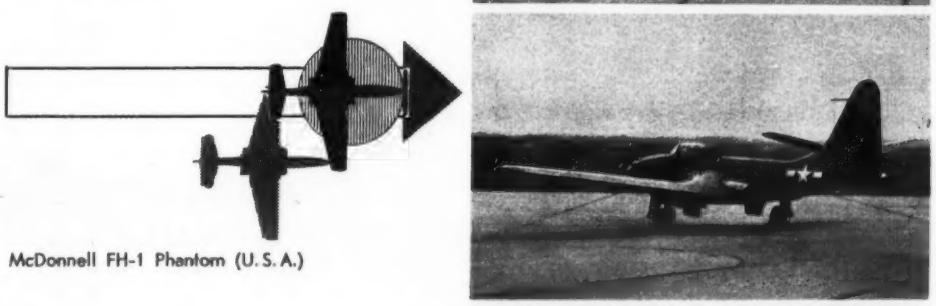
Svenska Aeroplan J-21R (Sweden)



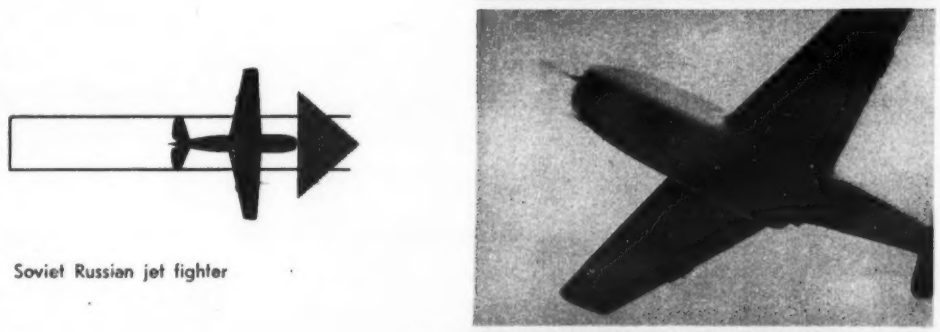
De Havilland Vampire III (Great Britain)



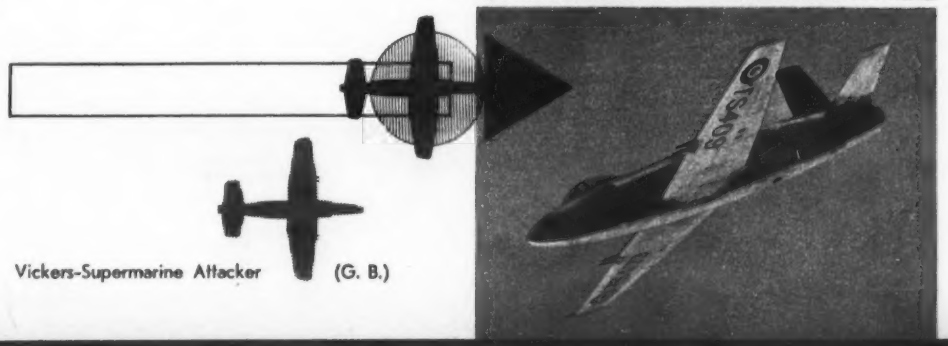
Northrop XP-79 (U. S. A.)



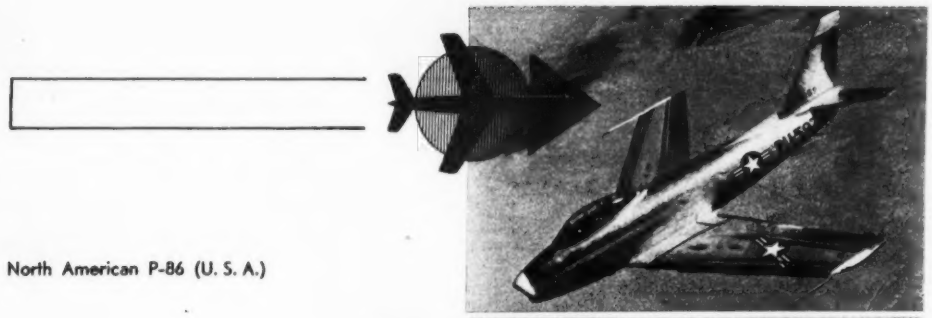
McDonnell FH-1 Phantom (U. S. A.)



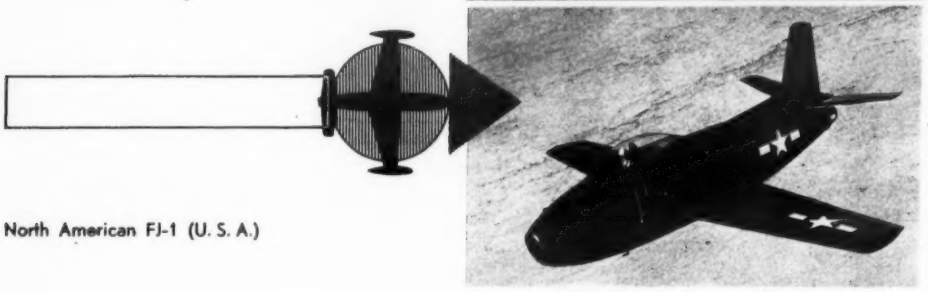
Soviet Russian jet fighter



Vickers-Supermarine Attacker (G. B.)



North American P-86 (U. S. A.)



North American FJ-1 (U. S. A.)

when the existing types had become too heavy because of the increased demands on armament and engine output—and it was never very long before the same light fighter had likewise to be classified again in the category of medium heavies.

Another especially small aircraft is the American F6U-1 "Pirate" developed by Chance Vought, though it should be pointed out that the indicated gross weight of 12,000 lbs. is not an official datum. Assuming it to be exact, however, this carrier-borne fighter would feature the extraordinarily high wing loading of about 65 lbs. per square foot. Approximately 95 per cent. of the total structure is made of "Metalite," a new sandwich material comprising a balsa wood core combined with aluminium-alloy faces, so that its weight data would have been of particular interest.

Country	Manufacturer or Designer	Designation	Engine Manufacturer and Designation	Max. Static Thrust lbs.	Dimensions Span ft.	Length ft.	Wing area sq.ft.	Weights Normal gross weight lbs.	Wing loading lb./sq.ft.	Weight : thrust ratio	Max. speed m.p.h
U.S.A.	McDonnell	XP-85	1 × Westinghouse 24C (J-34)	3,000	21'	15'	....	5,000	....	1.67	650
France	Arsenal	VG-70	1 × Junkers Jumo 004	c. 2,000	27' 11"	31' 10"	165	6,980	42.4	3.53	560
U.S.A.	Chance-Vought	F6U-1 Pirate	1 × Westinghouse 24C (J-34)	3,000	30' 2"	32' 10"	c. 185	....	....	....	500
Argentina	Instituto Aerotecnico Cordoba	I.Ae.27 Pulqui	1 × Rolls-Royce Derwent V	3,500	36' 11"	31' 9½"	c. 210	7,940	37.7	2.26	500
Sweden	Svenska Aeroplan	J-21R	1 × De Havilland Goblin II	3,000	38' 2"	34' 8"	c. 240	9,370	c. 39	3.13	c. 500
G.B.	De Havilland	Vampire I	1 × De Havilland Goblin II	3,000	40'	30' 9"	250.7	8,578	34.2	2.86	540
		Vampire II	1 × Rolls-Royce R.B.41 Nene I	5,000	40'	30' 9"	250.7	....	....	....	....
		Vampire III	1 × De Havilland Goblin II	3,000	40'	30' 9"	250.7	9,500	37.9	3.17	540
		Vampire V	1 × De Havilland Goblin II	3,000	38' 4"	30' 9"	....	....	....	....	....
		Sea Vampire XX	1 × De Havilland Goblin II	3,000	38' 4"	30' 9"	....	8,937	....	2.98	526
U.S.A.	Northrop	XP-79	2 × Westinghouse 19B Yankee	2 × 1,365	38'	11' 9"	....	9,600	....	3.51	500
U.S.A.	McDonnell	FH-1 Phantom	2 × Westinghouse 19B-2B Yankee	2 × 1,600	40' 9⅛"	37' 2½"	273.75	10,035	36.7	3.14	....
U.S.S.R.	Presumably Lavotchkin	....	2 × Tschelomej ... (BMW 003)	2 × 1,750	40'	35'	....	....	....	....	500
G.B.	Vickers-Supermarine	Attacker	1 × Rolls-Royce R.B.41 Nene I	5,000	36' 11"	37' 6"	226	11,300	50	2.25	590
U.S.A.	North American	P-86	1 × General Electric TG-180 (J-35)	4,000	37'	37'	....	13,715	....	3.45	650
U.S.A.	North American	FJ-1	1 × Allison — G.E. TG-180A5 (J-35-3)	4,000	38' 1"	33' 7"	c. 260	12,135	c. 47	3.04	c. 550
U.S.A.	Lockheed	P-80A Shooting Star	1 × Allison 400 — G.E. I-40 (J-33)	4,200	38' 10½"	34' 6"	237	14,000 [3]	59 [3]	3.34 [3]	558
U.S.A.	Republic	P-84 Thunderjet	1 × General Electric TG-180 (J-35)	4,000	36' 5"	37' 3"	c. 272	12,880	c. 47	3.23	620
U.S.A.	Grumman	XF9F-2 Panther	1 × Pratt & Whitney — R.R. Nene (J-42) or 1 × Allison 400 (J-33-8)	5,000 [1] / 4,600 [1]	....	....	....	....	....	....	600
G.B.	Hawker	N.7/46 Zephyr	1 × Rolls-Royce Nene II	5,000	....	....	....	....	....	....	600
U.S.A.	McDonnell	F2H-1 Banshee	2 × Westinghouse 24C (J-34)	2 × 3,000	41' 6"	38' 11½"	c. 290	14,000 [3]	c. 48	2.34 [3]	600
Germany	Messerschmitt	Me 262	2 × Junkers Jumo 004B	2 × c. 2,000	41' 6"	34' 9½"	234	c. 14,300	c. 61	c. 3.6	c. 530
G.B.	Gloster	Meteor III	2 × Rolls-Royce Derwent I	2 × 2,000	43'	41'	374	12,500	33.4	3.13	475
		Meteor IV	2 × Rolls-Royce Derwent V	2 × 3,500	43'	41'	374	14,460	38.7	2.06	585
		Meteor IV "Clipped Wing"	2 × Rolls-Royce Derwent V	2 × 3,500	37' 2"	41'	332	15,000	45.2	2.15	585
G.B.	Saunders-Roe	SR/A1	2 × Metropolitan Vickers F.2/4 Beryl	2 × 4,000	46'	50'	415	....	....	....	500
U.S.A.	Consolidated Vultee	XP-81	1 General Electric TG-100 (T-31) airscrew-turbine + 1 General Electric I-40 (J-33-3) jet engine	4,000 [2] + 600 / 4,000	50' 6"	44' 8"	425	19,500	45.9	2.28	500
U.S.A.	Curtiss	XP-87	4 × Westinghouse 24C (J-34)	3,000	60'	c. 65'	....	37,500	....	3.1	620

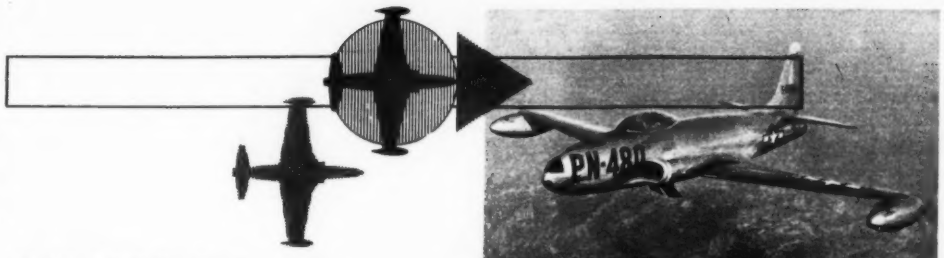
[1] With water injection, 5,750 and 5,000 lbs.

[2] Static thrust of airscrew estimated from 2,200 H.P. turbine shaft power.

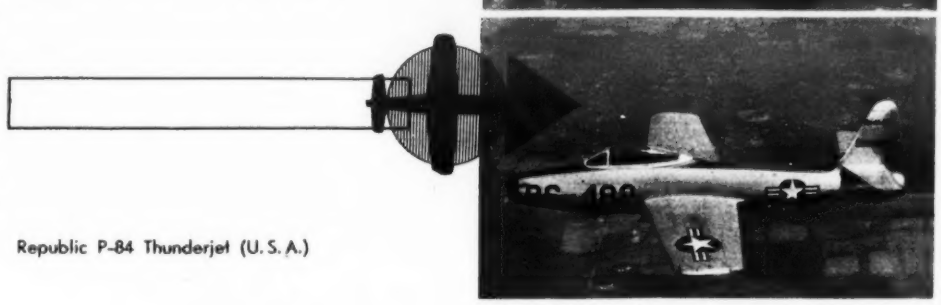
[3] Max. weight.

At the other end of the list are three types which stand out among the others because of their size and weight: the Saunders-Roe SR/A1 fighter flying-boat, the Consolidated-Vultee XP-81—which in addition to a jet engine for high-speed flying has a "foot-slogging" airscrew-turbine for cruising—and finally the already-mentioned Curtiss XP-87 four-engined two-seater long-range fighter.

The Northrop XP-79 experimental aircraft is not so remarkable for its dimensions as for its configuration and operational purpose. When the first photos of it were released, one was apt to judge it as one of the many implements of warfare which the U.S. Air Force tried out towards the end of the War, shelved, and later released for public information. For this reason, it did not draw a great amount of attention. However, it can now be seen from the U.S. Air Force's latest procurement



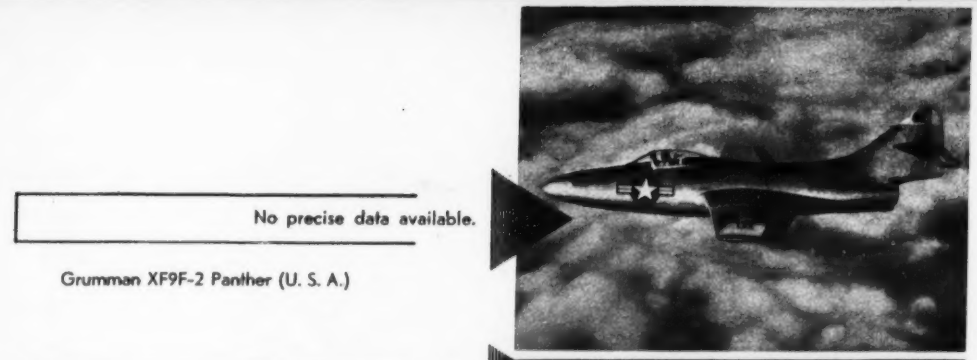
Lockheed P-80 Shooting Star (U.S.A.)

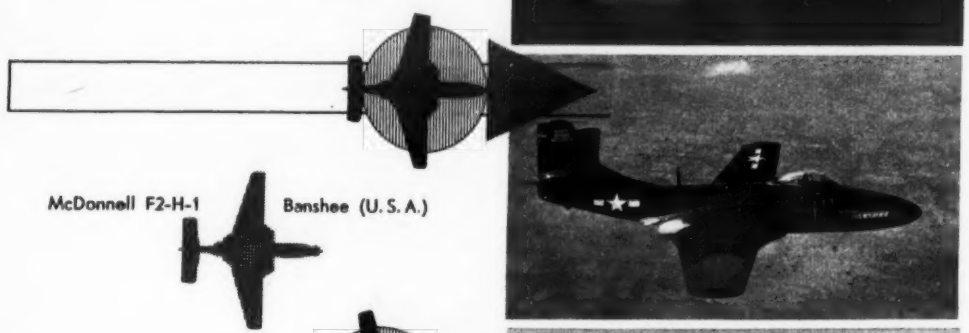


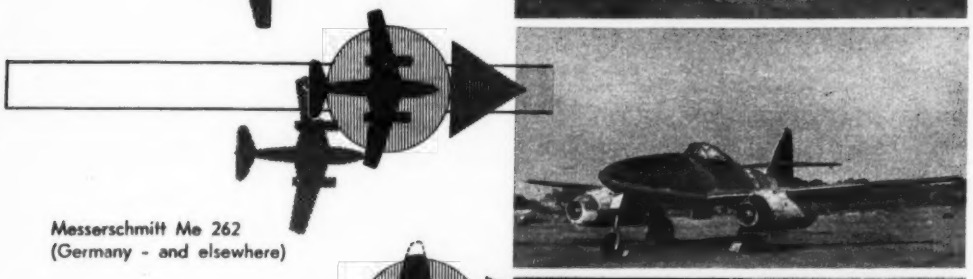
Republic P-84 Thunderjet (U.S.A.)

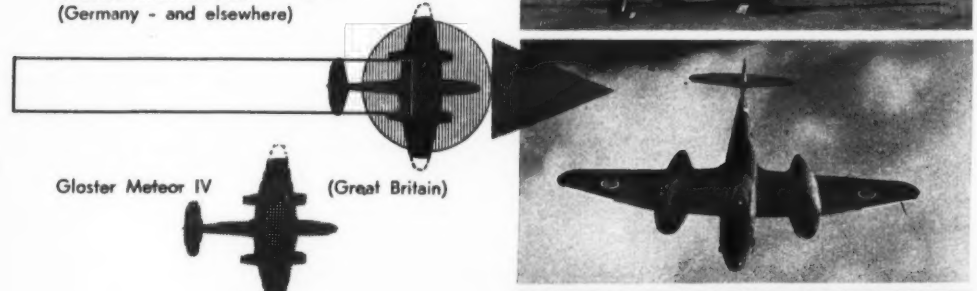
Performance				Built-in Armament		Armament, Auxiliary Fuel Tanks	Observations
Max. speed m.p.h.	Rate of climb ft./sec.	Ceiling ft.	Max. range miles	M.G. 12.7-mm.	Cannon 20-mm.	R = Rocket missiles B = Bombs A = Auxiliary Tank (Total volume)	
650	....	45,000	....	4			Carrier defence fighter for heavy bombers
560	....	....	....	....	....		
500	....	....	750	6 or 4			"Metalite" construction
500	....	....	(1 hr.)	....	....		
c. 500	....	40,700	....	....	....	A	
540	70	48,000	1,050	—	4	A 200 Imp. Galls.	
....	....	51,000	....	....	....		Built under licence in Australia
540	72.5	43,500	1,400	—	4	8 R of 60 lb. + 1 B of 500 lb. A 200 Imp. Galls.	Modified empennage; also Mark VII with Goblin III for Sweden
....	....	....	....	....	....		
526	79.2	45,000	....	....	....		
500	63	37,000	....	4	—	To be fitted with armour-plated leading edge for ramming attacks	Experimental all-wing type of welded magnesium
....	....	....	1,000	4	—		
500	....	....	....	....	2 [5]		According to other sources, construction by Mikoyan and Gurevitch
590	110	48,500	1,100 [4]	—	4	4 R of 300 lb. 2 B of 1,000 lb. A 270 Imp. Galls.	
650	....	....	....	....			
c. 550	....	....	800	6	—	A	
558	83.3	45,000	2,000	6	—	2 B of 500 lb. + 330 U.S. Galls.	No numerical data available on newest P-80B version
620	....	40,000	1,000	6	—		
600	....	....	....	....	....		
600	....	....	....	....	....	B 2,000 lb.	
600	150	....	....	....	....		
c. 530	65	37,750	620	—	4 [6]	1 B of 1,100 lb. 2 B of 550 lb. 24 R of 55 mm.	Built under licence in U.S.S.R. ?
475	66.7	44,000	....	—	4		
585	131.7	52,000	950	—	4	A 180 Imp. Galls.	
585	122.5	49,000	1,000	—	4	8 R of 90 lb. 2 B of 1,000 lb. A 380 Imp. Galls.	
500	....	....	....	—	4	A 282 Imp. Galls.	Fighter flying-boat
500	....	....	....	6	—	R B	
620	100	40,000	2,000	10	—		Two-seater long-range fighter

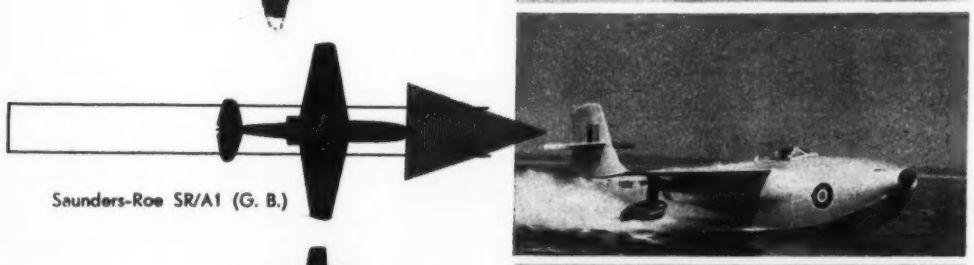
[4] Plus 15 min. flight at combat output. [5] Calibre not known. [6] Calibre 30 mm.

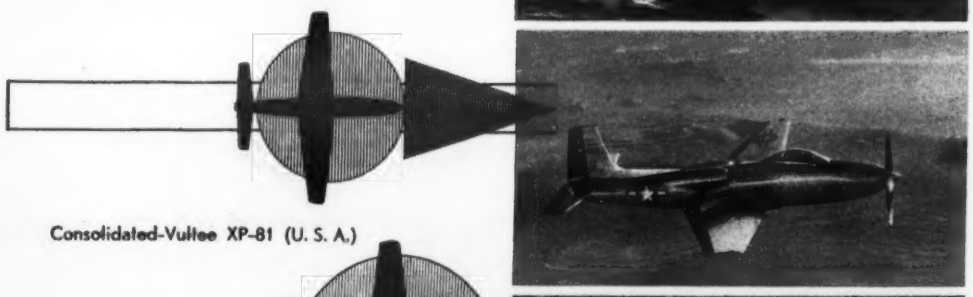


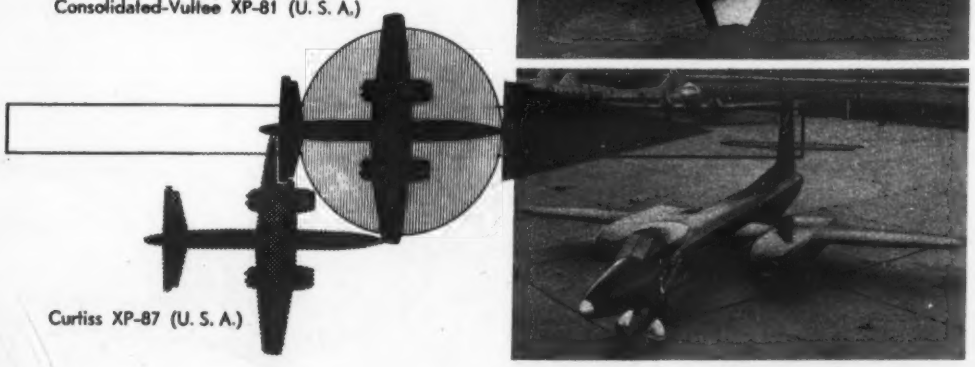












programme that the XP-79 is still being tested, although the first prototype crashed in 1945. Everything about this aircraft is unusual : its all-wing configuration ; its construction of magnesium and the "Heliarc" welding method used, in which the welding tip is surrounded by a bath of helium ; the prone position of the pilot in order to increase his ability to withstand high pulls ; the "bellows rudder" installed in each wing to provide a yawing movement without pitch or roll ; and finally the idea of destroying an enemy by ramming him, for which the leading edge of the wing is to be heavily armoured.

This review would not be complete if no mention were made of new jet fighters of which the prototypes are somewhere between drawing board, wind tunnel and closed hangar doors, and concerning which no precise data are available as yet. The U.S. Air Force has already distributed the XP designations (Experimental Pursuit) from 88 to 92, and in every instance for aircraft which are expected to attain supersonic speeds : McDonnell XP-98, Northrop XP-89, Lockheed XP-90, Republic XP-91 and Convair XP-92. For the Navy, the Chance Vought Aircraft Division has brought out its XF7U development of the "Pirate," Douglas has developed its twin-engined XF3D, and Grumman has designed a fighter designated XF10F. In England a radically improved Mark V version of the famed Gloster "Meteor" is under way ; the same firm had already completed the prototype of an entirely new jet fighter, the Gloster E.1/44, by the end of last summer, which was damaged beyond repair when the lorry carrying it to the proving ground crashed. Sweden, whose air force already features a fair number of de Havilland "Vampires" purchased in England, and where tests are already being carried out with the jet-propelled J-21R version of the J-21 piston-engined fighter, has announced her intention to make herself independent of foreign supplies ; and the Svenska Aeroplan A. B. has already announced the approaching completion of a single-seater jet fighter, the J-29 (SAAB 1001). Finally, French manufacturers are announcing the forthcoming completion of the Arsenal VG 90, and the Nord 2200 which is to be fitted with a Rolls-Royce "Nene."

The jet fighter, as we know it today, rules over the narrow speed range extending from 500 m.p.h. almost to the absolute speed record. The latter record, which stands at 650.9 m.p.h., was not, however, established with a real fighter aeroplane, but with a special type developed for research at supersonic speeds, the Douglas "Skystreak."

Although it is possible that some of the fighters listed here may still attain or even exceed the 650 m.p.h. limit before the year is out, we are all the same justified in saying that the development of the subsonic fighter aeroplane can go no further as regards the speed factor. By the time research aircraft have exceeded the speed of sound, however, and man has finally "got his sea-legs" beyond the sonic barrier so as once more to take up his arms, it may be that we shall see faster fighters again. Alas ! *T.*

XUM

Radio Navigation for Private Flying

Radio navigation, and for that matter the use of radio in flying at all, has hitherto been the particular privilege of large aeroplanes. A personal plane or a small executive transport cannot carry elaborate and heavy radio equipment, and the pilot certainly cannot be additionally burdened with the complicated work of a navigator.

In the last ten years, however, radio technique has taken a number of important steps forward, which, at a future date, should make the advantages of radio communication and navigation available to private flyers too. Modern equipment, on the one hand, has become smaller and lighter, and on the other hand, new methods of radio communication and position-finding have arisen ; by making the operating procedure largely automatic, these have rendered radio operator and navigator to a certain extent superfluous.

Many of these innovations are still in the experimental stage, so that the technical prerequisites enabling private aviation to share effectively in the newly-opened possibilities are not yet available. However, the time seems ripe for private flyers to make known their requirements with regard to the future safety measures which radio will provide. The entire future growth of private flying is essentially dependent upon whether or not it is to remain without radio support and at a disadvantage compared with commercial flying. In the near future the navigation methods used up till now will probably be supplanted by more modern ones, some of which were already tried out during the last war. Perhaps—and it is to be hoped —this will be accompanied by a standardisation of equipment and procedures, so that uniform navigation with the same means will be possible in all countries. If in the course of this adaptation the needs of private flying are not forgotten, the latter branch of aviation will be able to profit by at least some of the radio aids to navigation.

Technical Demands

It is fortunate that the conditions with which the radio equipment of personal aeroplanes must comply are subject to certain limitations. In view of their moderate range compared with airliners flying long overseas routes, systems intended particularly for long-distance navigation do not need to be considered. Instruments for absolute blind landing can likewise be dispensed with, since regular flights in all weather conditions, as applies to commercial flying, are not necessary. These two limitations facilitate matters considerably, for the most important problems to be solved are now only two : medium- and close-range navigation. On the other hand certain requisites must be emphasised all the more strongly :-

1. Aircraft radio equipment must be light and compact.
2. If possible no aircraft transmitter should be required. If this cannot be avoided, a low transmitter output must suffice.
3. When flying towards a ground transmitter, it must be possible to follow the arc of a great circle (i.e. without drift) with the aid of left-right signals.
4. It must be possible to establish fixes continuously and without loss of time due to additional calculation or plotting.
5. All indications given by the instruments must be clearly visible and unambiguous.
6. Operation of the radio equipment must be confined to simple switch operation.

As soon as there are sufficient ground transmitters, there is no need to stipulate further that left-right indications be provided for flying every great circle course. A private aviator will gladly put up with slight detours as long as he can reach his objective in safety.

Suitable Navigation Systems

It cannot yet be forecast with certainty which of the new systems of radio navigation at present available will finally be adopted internationally ; but it is already possible to discern the path which the development will probably follow.

No doubt it will not be the old direction-finding systems (D/F reception) which will characterise air navigation of the future. More probable is that general preference will be given to navigational methods employing continuously-operated directive-signalling beacons, enabling navigational data to be obtained at any time without the need for special communication between aircraft and ground transmitter. Taking this into account there remain only few navigational systems likely to satisfy the requirements of both commercial and private flying. In the foreground, however, are the principle of distance differential measurement (" Decca " or " Loran ") and the principle of absolute distance measurement (" Shoran ," and so forth), in conjunction with azimuth determination (" Navaglobe," " Navar "). The majority of these systems originates from the United States.

Of these methods, that based on *distance differential measurement* is probably the least suitable for the purposes of private aviation. Although it enables positions to be found with great accuracy at long range by the use of hyperbola charts and without the need for an aircraft transmitter, it does not provide by itself any simple possibility of taking bearings, particularly at close range when approaching an airfield in conditions of poor visibility. Furthermore, the operation of the equipment in the aeroplane is not so simple as could be desired.

Azimuth measurement with the help of omni-directional radio beacons seems to be the most suitable system for taking bearings and backbearings, especially between airports equipped with the necessary trans-

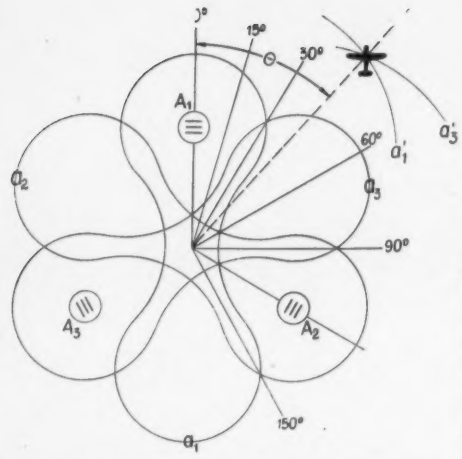


Fig. 1: Navaglobe: directional transmission principle for azimuth measurement.
Three directional antennae radiate pulses successively with characteristic shifted progressively by 120 deg. Azimuth determined by comparing intensity of pulses received. A_1, A_2, and A_3: transmitting antennae in triangle with 0.4 wavelength distance; a_1, a_2, and a_3: lobes of equal field strength.

mitting equipment. At present there are two methods competing in this field. The Navaglobe system, for instance, uses the rotating lobes of several directional antennae, and enables the pilot to determine azimuth by intensity- or phase-comparison (Fig. 1). The azimuth measurement used in the Navar method is explained in Fig. 2. Over a range of 360 deg. about the transmitter, both these systems give an exact indication, in degrees azimuth, of the aircraft's compass heading relative to the transmitter. The indications appear continuously on the instruments without need for intervention by the pilot; and any specific heading can easily be maintained by following left-right deviations. However, two transmitters located at favourable angles to each other, as well as two successive measurements, are necessary for finding a position by this method. The suitability of the principle of azimuth measurement alone for position-finding is therefore largely dependent on the density of the network of beacons available.

The combination of azimuth measurement with *absolute distance measurement* is the most satisfactory method of position-finding. It enables a bearing to be taken as well as an exact fix, and is also of great value for approaching runways in poor visibility, in so far as landings entirely on instruments are not contemplated. Meanwhile, the aircraft must be equipped with a transmitter, even if it is only a weak one. The time needed for a radio pulse to travel to a pulse responder beacon and back is measured (Fig. 3). The instruments give direct and continuous indication of the distance between the aircraft and the responder beacon. A completed combination of azimuth and distance measurement (as shown in Figs. 2 and 3) can be found in an adaptation of the already-mentioned Navar system. This has been recommended by PICAO for standard adoption, and may be regarded as an example of a navigational system which would go a long way towards meeting the requirements of private aviation, provided low weight and simple operation can be achieved.

We will refrain from discussing the details, advantages and disadvantages of the systems referred to here, especially as their technical development is not yet complete. It suffices to say that the method of azimuth-cum-distance measurement is to be regarded as the most promising for medium-range overland navigation, and that it is already being tested for use in commercial aviation. To all appearances it could be adapted to the needs of private flying without any special difficulties, though it remains to be settled whether distance measurement, necessitating an aircraft transmitter, can be dispensed with or not.

Fig. 2: Azimuth measuring method.
A non-directional pulse transmitter B synchronised with rotating beam of omni-directional transmitter *A*, *B* giving short characteristic signal every time beam passes through north direction. Azimuth Θ derived from time-lag between reception of characteristic pulse and reception of beam. Indication either by pointer instrument or cathode ray tube.

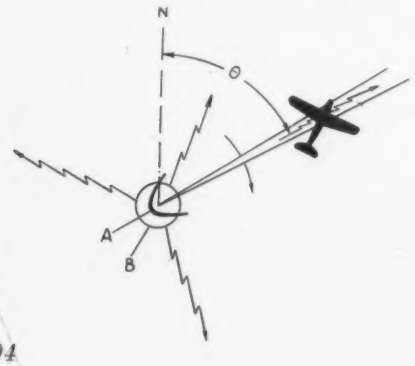
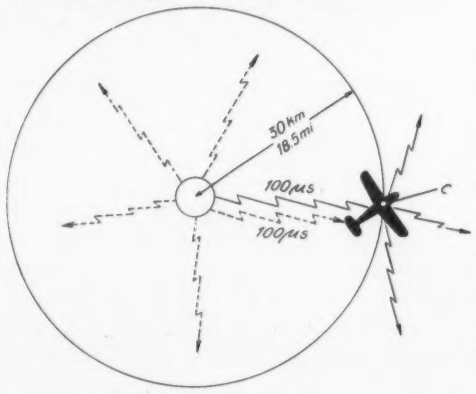


Fig. 3: Principle of absolute distance measurement.
Pulses of aircraft transmitter *C* radiated in all directions are amplified and repeated without loss of time by responder beacon *C'*. Distance of aeroplane from responder beacon determined by time required for pulse to travel back and forth. (Example in diagram for 200 μs corresponding to distance of 30 kilometres.)



Additional Voice Communication

If any thought is given to fitting personal aeroplanes with radio, then consideration should simultaneously be given to their provision with voice communication equipment for enabling information on weather, etc., to be obtained from the ground. This item is perhaps more important and urgent than radio navigation.

The fact that, with a few exceptions, voice broadcasting facilities have so far not been available to private aviators, is due to a number of technical reasons (e.g., the short range of weak transmitters) and also to limitations of an organisational nature, such as an insufficient number of available wavelengths, for example. But since modern radio technique has developed long-range broadcasting with the aid of repeaters and the multi-channel transmitting system, radio telephony is no longer an unsolvable problem for small aircraft. The police radio system existing in Great Britain and the United States of America, for instance, could serve as a pattern. Communication between moving patrol cars and police headquarters is accomplished in the metre-wave range with small low-power transmitters of a few watts. A network of automatically-serviced repeaters, located twenty to forty miles apart, relays the transmissions, with the result that great distances can be covered by low-power equipment without disturbance. Furthermore, several conversations can be broadcast simultaneously on a single carrier wave by using the multiplex circuit.

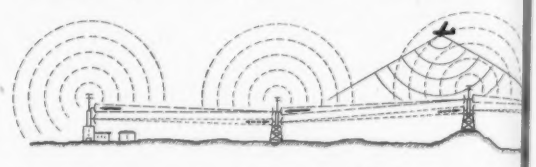
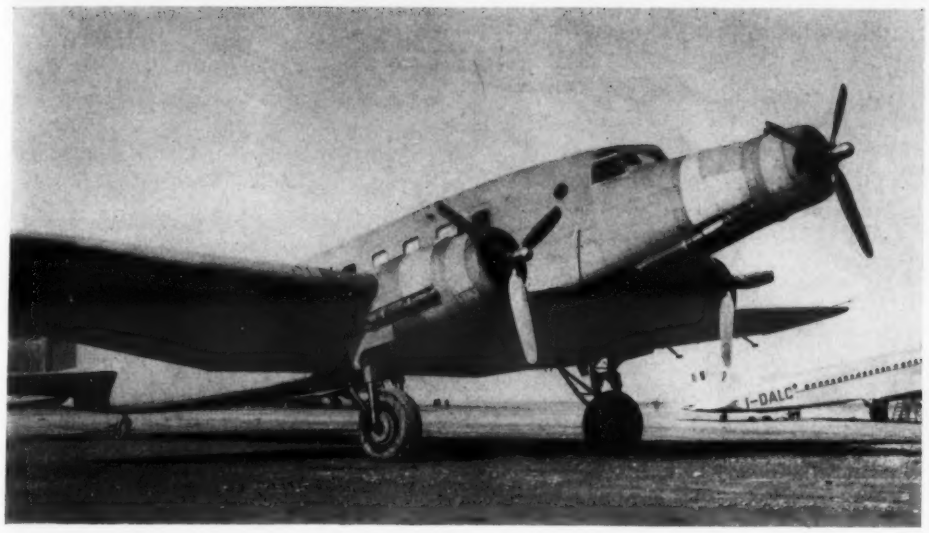


Fig. 4: Schematic presentation of aviation radio telephony over a chain of repeaters.

This system could be applied without further ado to the purposes of aviation radio telephony (Fig. 4). With the ranges attained by the repeaters it would be possible to reach the uttermost limits of optical vision. If pulse-modulated multiplex transmission is used, eventually on decimetre or centimetre waves, it should be easy to cope with heavily-loaded airways. A radio repeater network specially erected for private flying is, of course, hardly conceivable. Such an installation could only be thought of if it were primarily for commercial aviation, and secondarily for the use of other aircraft. Meanwhile, however, there are many signs that development will take this course.

For the present, the question whether the double equipment of light aeroplanes with radio for both navigation and telephony will be possible, must be left in abeyance. Perhaps the development of combination radio sets will be accompanied by such a saving in weight that small executive transports and personal planes will be able to enjoy the full benefits of modern radio technique. This would mean an important step forward in an agreeable and promising sphere of aviation. *Sch.*



FIAT G 212

" MONTEROSA " and " MONVISO "

The flying equipment with which the Italian carriers started domestic services a year ago [1] and have been using to fly international routes for the past few months include, apart from Douglas C-47 (DC-3) " Skytrains " purchased from Allied surplus stocks and converted by the Fiat concern, a number of Italian types which were completed after the cessation of hostilities. The best known of these are the four-engined SIAI-Marchetti SM 95 for twenty-four to thirty-six passengers [2] and the three-engined Fiat G 12L for eighteen to twenty-two passengers.

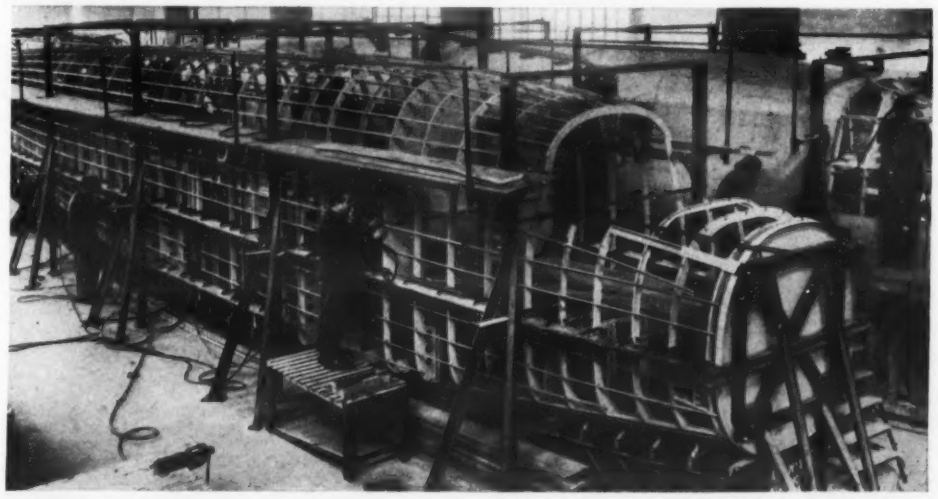
The original Fiat G 12 was designed before the War as a commercial transport for flying in the Alps and unter winter conditions. This was a fourteen-passenger version which was later produced on a fairly large scale for military purposes. A small number of its latest version, the G 12L mentioned above, was being built at the time when Northern Italy was liberated, and twenty units were delivered to airline companies during the course of 1947. This aircraft is remarkable for its very low wing loading, which enables it to take off and land where only small and primitive airfields are available, and it has proven its usefulness during the reconstruction of Italian civil aviation. For the same reason, it can carry a heavy load : its disposable load could be increased from 8,400 lbs. in the case of the prototype, to 11,800 lbs. for the G 12L version. In order to exploit this advantage even more fully, a radically new construction with longer and wider fuselage was undertaken. This gave birth to the new type, the Fiat G 212, which features the same wing dimensions as the G 12 but can now cope with a disposable load of 14,870 lbs.

This improvement in the load-carrying capacity was also made possible by another modification. The Fiat A 74 RC 42 engines of 760 H.P. rated power fitted to the original G 12 model, which are no longer manufactured today, were replaced by more powerful Pratt & Whitney S1C3-G(R-1830) " Twin Wasp " radials of 1,050 H.P. rated power and 1,200 H.P. for take-off. In addition to the G 212, a number of the G 12L versions were also equipped with the U.S. power plants.

The prototype Fiat G 212, which happens to be fitted with Alfa Romeo 131 RC 14/50 nine-cylinder radials of 1,125 H.P. for take-off, made its initial flights in January, 1947. Four of these aircraft were completed by the middle of last February, and two units are being rolled off the assembly line each month. Avio Linee Italiane (ALI), a Milanese carrier which is a subsidiary of the Fiat concern, already put a few G 212's into service on March 17th, 1948. Other aircraft of this type have been ordered by the newly-founded Italo-Egyptian company, Services Aériens Internationaux d'Egypte, and from the Aviation Department of the Italian Ministry of Defence. Negotiations are under way with Compagnia Aeroespressi AIAX, a Milanese charter carrier, for the delivery of a number of freight transports.

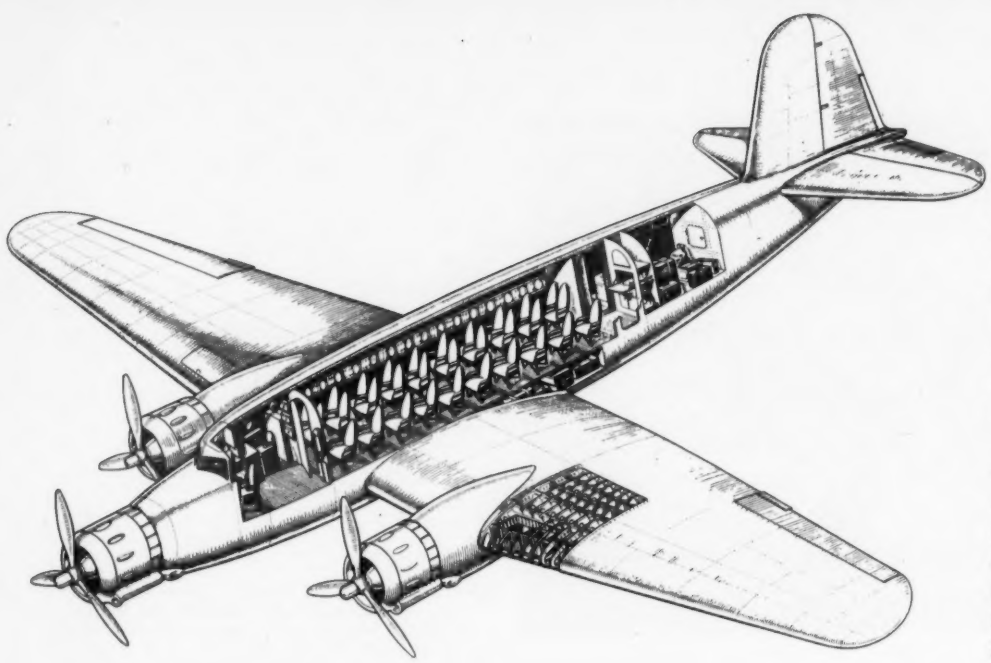
The Fiat G 212 is being built in two versions. One of these is a passenger transport, known as the *G 212 CP " Monterosa " Aeropullman*, which customers can have with either 26, 30 or 34 seats in three columns, or with 38 seats in four columns. The other version, which is the *G 212 TP*

Fuselages under construction.



[1] Cf. " INTERAVIA, Review of World Aviation " No. 4, April, 1947, p. 22.

[2] Cf. " INTERAVIA, Review of World Aviation " No. 2, May, 1946, p. 46-47.



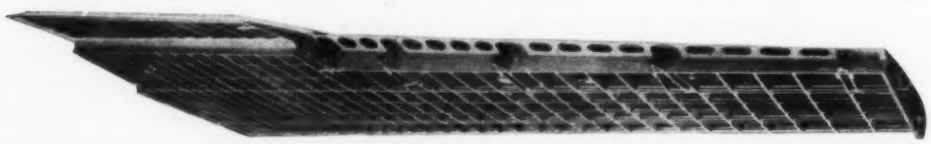
"*Monviso*" *Aviocargo*, has the same inner and outer dimensions as the "Monterosa" but is for cargo transportation. It can take on 9,920 lbs. of payload and can be used as a troop transport for 36 men, or as an ambulance plane for carrying 21 stretcher patients and two attendants.

In both versions there is a two-seat pilots' compartment behind the middle engine and, further aft, the radio operator and navigator's stations, the latter not being separated from the pilots' compartment by a dividing wall. Behind the passenger or cargo compartment, both versions of the G 212 have a special luggage hold in the tail of the aircraft. Three box-shaped holds for additional luggage or freight are located beneath the cabin floor, one fore and starboard of the wing centre-section and the two others on either side of the fuselage, aft of the wing. Hatches are provided for access from the ground.

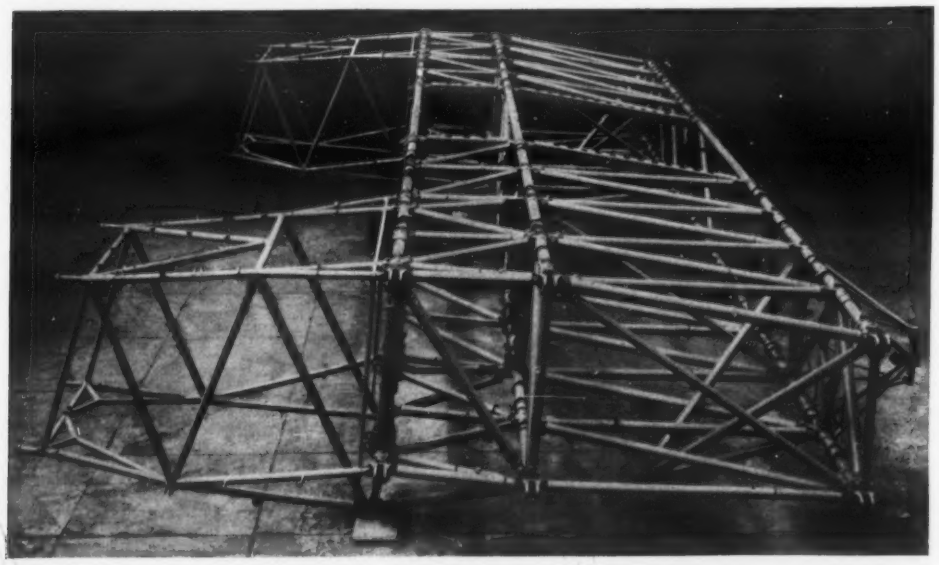
The fuselage of the G 212 is of light-alloy monocoque construction with metal frames of ⊏-section, Z- and Ω-extruded longitudinal stiffeners. For attaching the low-set wing running beneath the cabin floor, the sidewalls feature a riveted stiffening lattice built up of square-section hollow members of duralumin.

Apart from the interchangeable tips, the wing comprises three sections. The centre section is built up of a steel-tube lattice and metal ribs supporting the metal-covered leading-edge portions and the upper and lower surface panels. The rear part of the wing features similar ribs, but is mainly covered with fabric. The outer wings are built up of three spars with duralumin profile-shaped flanges and reinforced metal webs, which, together with the metal skin, build up to a box. The metal skin is again reinforced by a number of stringers. As in the centre section, the ribs are of metal and the rear-part covering of fabric.

Light-alloy construction of an outer wing : three spars with webs ; stringers running parallel.



Steel-tube lattice of wing centre-section, with mounts for outboard engines and retractable undercarriage.



Four split flaps are arranged in the trailing edge of the wing, two in the centre section and one in each outer wing. They can be moved by hydraulic means through 50 deg. and are built up of a tubular spar of light alloy, metal ribs, and are metal-covered on the lower surface only. The ailerons, occupying the remaining span nearly up to the wing tips, likewise feature a metal structure but are fabric-covered. They are actuated directly by torque tubes, levers and connecting rods.

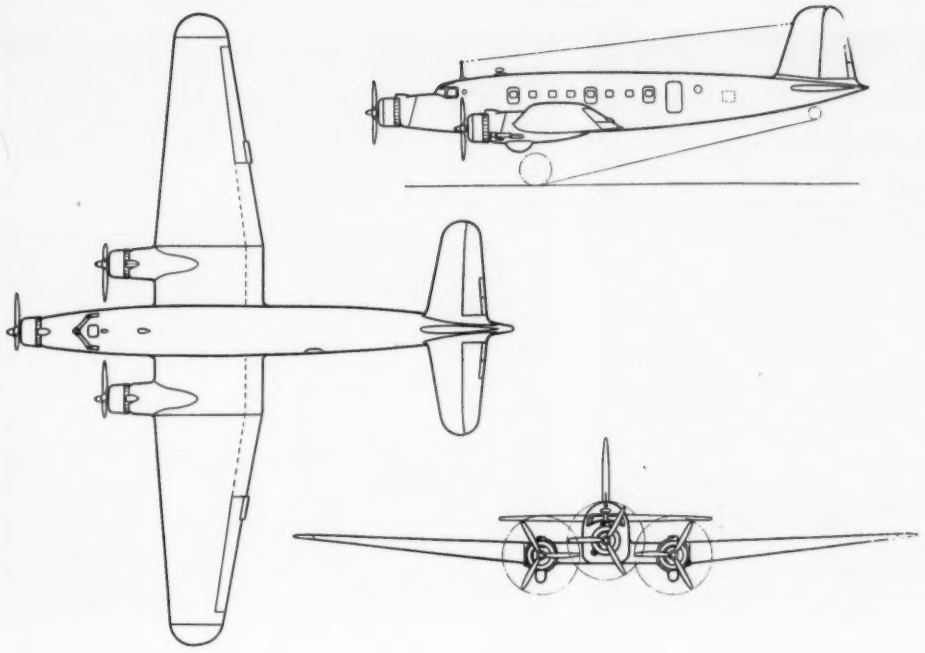
The fixed control surfaces of the empennage are of cantilever construction. They attach with steel fittings to the fuselage and each is formed of two spars, flanges and metal webs. Ribs stamped out of sheet metal and stringers running parallel to the spars complete the framework on to which the metal skin is riveted. The tail plane and the elevator are each formed of two interchangeable halves. The movable surfaces have a reinforced metal leading edge riveted to the ribs,and are fabric-covered. The elevator is actuated directly by push-rods and intermediate levers. The rudder operation is a mixed transmission of push-rods, segment levers and double cables. Torque tubes are used for working the ailerons. Trimming tabs are fitted to the trailing edges of all the control surfaces, and can be adjusted from the cockpit.

Like many of the postwar transitional aircraft, the Fiat G 212 has a tail-wheel undercarriage.

The oleo-pneumatic and compressed-air shock-absorbing fork holding each main landing wheel and forming the "lower limb" of the undercarriage strut is articulated to an "upper limb" in the form of a welded steel-tube trestle, attaching with two bolts to the lattice structure of the wing. A one-piece supporting strut leads from the lower end of each fork to an articulated joint at the rear spar. When the hydraulic retraction mechanism is worked, the undercarriage struts move in the same manner as a human leg, thus bending upward and forward, whereby the wheel comes to lie in the nacelle, between engine and wing, and is closed in by doors in such a way that only a very small part protrudes beneath the cowling. The main wheels are equipped with compressed-air brakes.

The tail-wheel, on the other hand, is not retractable. It is mounted on a swivel fork held in a central position by rubber shock

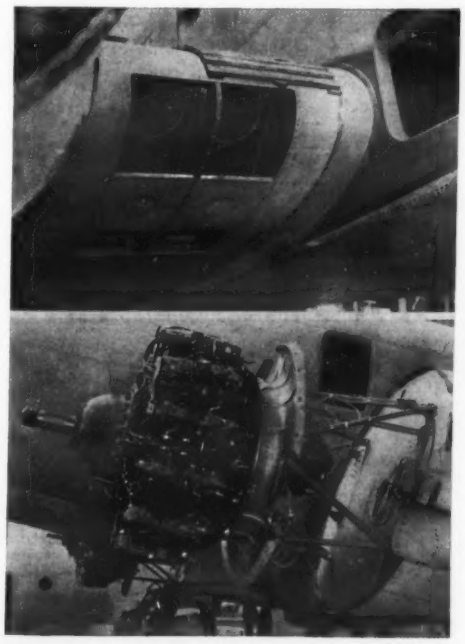
Engine disposition: Heating jackets surrounding the exhaust pipes of the outboard engines deliver hot air for heating the cabin.



cords, and a mechanism provides return and locking in centre position.

The power plant comprises three Pratt & Whitney engines of the same type as those installed in the twin-engined Douglas DC-3. In quite a number of ways the Fiat G 212 can be compared with a " one-and a half-fold DC-3." The fact that it is powered by three engines of course has the advantage that, in the event of one engine's failing, only two thirds of the power is lost. In this way the G212 will be able to meet ICAO's strict regulations on performance with one engine failing at take-off, more easily than a twin-engined aircraft.

The mounting of an outboard engine with the bearers attaching at four points. Above is the leading-edge arrangement of the oil coolers for the starboard and middle engines ; a luggage hold in the port outer wing takes the place of a second oil cooler.



DIMENSIONS

Wing span	96 ft. 3 5/16 in.
Tailplane span	32 ft. 9 3/4 in.
Length	76 ft. 9 3/8 in.
Height	21 ft. 4 in.
Undercarriage track	20 ft. 6 in.
Aspect ratio	7.37

AREAS

Wing	1,255 sq. ft.
Ailerons	81.2 sq. ft.
Flaps	118.1 sq. ft.
Tailplane and elevator	201.8 sq. ft.
Fin and rudder	102.9 sq. ft.

POWER PLANT

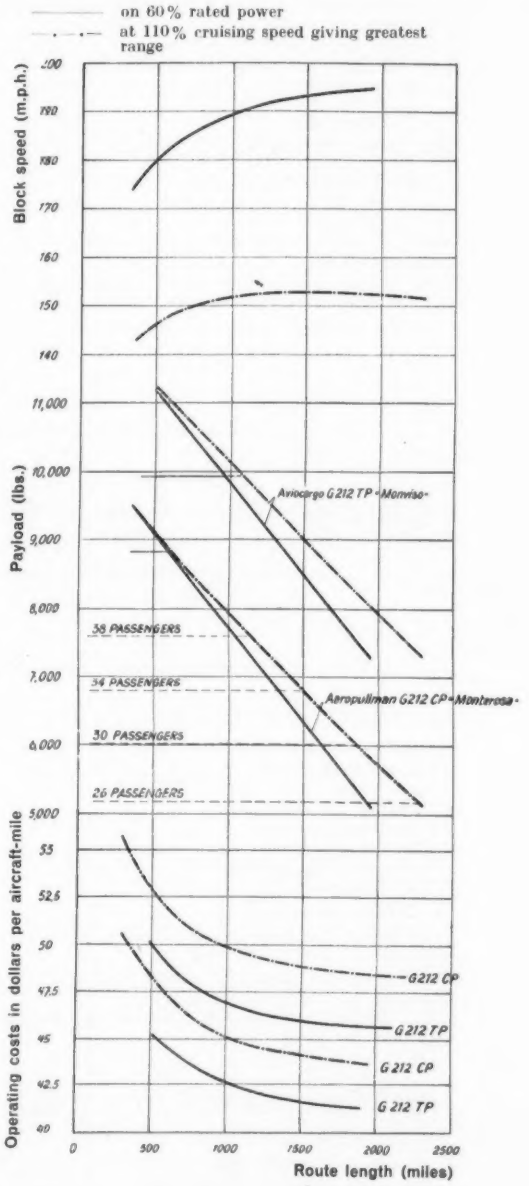
Three Pratt & Whitney S1C3-G (R-1830) " Twin Wasp " four-row radials with Hamilton Standard three-blade hydromatic airscrews :

Take-off power at 2,700 r.p.m.	1,200 H.P. up to 4,900 ft.
Max. continuous power (METO) at 2,550 r.p.m.	1,050 H.P. up to 7,500 ft.
Cruise power at 2,325 r.p.m.	700 H.P. up to 15,000 ft.
Airscrew gear ratio	1 : 0.5625
Airscrew diameter	11 ft. 9 3/4 in.
Fuel tanks :	
8 in wing centre-section)	
2 in outer wings)	988 Imp. Galls.
2 auxiliary in outer wings	352 Imp. Galls.
Total oil supply	66 Imp. Galls.

WEIGHTS

	G 212 CP " Monterosa " passenger transport	*G 212 TP "Monviso " freight transport*
Empty weight	23,810 lbs.	23,590 lbs.
Radio equipment	310 lbs.	310 lbs.
Blind-landing equipment	65 lbs.	65 lbs.
Autopilot	90 lbs.	90 lbs.
Deicers (wing and empennage)	200 lbs.	—
Airscrew deicers	65 lbs.	65 lbs.
Oxygen equipment	285 lbs.	130 lbs.
Buffet	90 lbs.	—
Tare weight	24,915 lbs.	24,250 lbs.
Crew (4 or 3 members)	745 lbs.	560 lbs.
Disposable load	12,700 lbs.	14,870 lbs.
Take-off weight	38,360 lbs.	39,680 lbs.
Landing weight	38,360 lbs.	38,360 lbs.
Wing loading	30.6 lb./sq. ft.	31.7 lb./sq. ft.
Power loading	10.65 lb./H.P.	11.0 lb./H.P.

Block speed, payload and operating costs, versus route distance

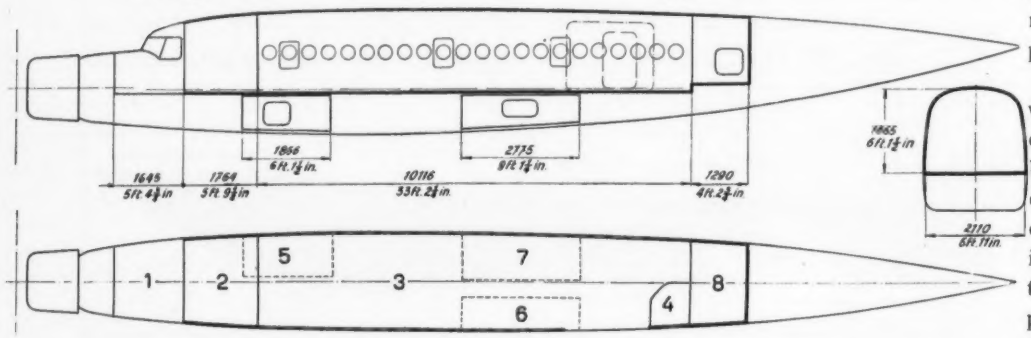


N.B. The disposable load comprises the payload given in the diagram, the fuel supply for the specific route and 2,040 lbs. of reserve fuel (1,350 lbs. for 200 miles plus 45 minutes, according to ATA), oil, etc.

Fuselage skeleton and furnished cabin.

PERFORMANCE

Max. speed at 8,200 ft.	233	m.p.h.	230.5	m.p.h.
Cruising speed (60% max. continuous power) at 10,000 ft.	194	m.p.h.	193	m.p.h.
110% cruising speed for max. range	151	m.p.h.	152	m.p.h.
Minimum speed at sea level with flaps down	78	m.p.h.	78	m.p.h.
Rate of climb (on max. continuous power) :				
at sea level	20.2	ft./sec.	19.2	ft./sec.
at 5,000 ft.	20	ft./sec.	18.75	ft./sec.
at 10,000 ft.	17.6	ft./sec.	15.6	ft./sec.
ditto with one engine cut out :				
at sea level	8.85	ft./sec.	8.2	ft./sec.
at 5,000 ft.	8.35	ft./sec.	7.55	ft./sec.
at 10,000 ft.	5.75	ft./sec.	5.25	ft./sec.
Service ceiling	22,300	ft.	21,650	ft.
Practical ceiling with one engine cut out	14,900	ft.	14,400	ft.
Take-off distance	1,250	ft.	—	
Take-off distance to clear 50-ft. screen with one engine failing at the moment of becoming airborne at 100 m.p.h.	2,560	ft.	—	



VOLUMES AND FLOOR AREAS

	Volume (cu. ft.)	Floor Area (sq. ft.)
1 Pilot's compartment	110	29.9
2 Radio compartment	176	36.8
3 Main cargo cabin (G.212 TP)	1,144	215.3
4 Lavatory (G.212 TP)	46	11.8
5 Front luggage hold }	35	17.4
6 Port luggage hold } under cabin floor	30	17.9
7 Starboard luggage hold }	49	29.8
8 Tail luggage hold	104	25.0
Total fuselage volume	1,694	383.9
Including cargo and luggage holds (G.212 TP)	1,362	305.4
Luggage containers in wing	29	9.0
Total cargo and freight volume (G 212 TP)	1,391	314.4
Capacity at 10 lb./cu. ft.	13,910 lbs.	
Total luggage volume with passengers on board (G 212 CP)	247	99.1
Capacity at 10 lb./cu. ft.	2,470 lbs.	

PAYLOAD DISTRIBUTION	Only freight lbs.	26 pass. lbs.	30 pass. lbs.	34 pass. lbs.	38 pass. lbs.
Passengers at 170 lbs.	—	4,420	5,100	5,780	6,460
Passenger luggage at 30 lbs.	—	780	900	1,020	1,140
Freight	9,920	1,690	1,570	1,450	1,220
Total payload	9,920	6,890	7,570	8,250	8,820
Corresponding ranges	600 miles	930 miles	710 miles	500 miles	370 miles

The three engines are supported by welded steel-tube mounts attaching at four points to the fire walls. Self-sealing Argus joints for all conduits, and quick-fastening connections throughout, enable the engines to be detached in the shortest possible time.

There are ten fuel tanks, eight in the wing centre section and the other two in the outer wings. If desired, an additional tank can be built into each outer wing. The fuel pump of each engine draws from a given group of tanks, though the arrangement is such that any engine can be fed by the tanks and pumps of the other engines. On the other hand, each engine has its own oil tank with closed lubrication circuit, and an oil cooler built into the wing leading edge, near to the nacelle.

We shall not go into the details of the various items of equipment. Most of the remote actuations are hydraulic, though the landing-wheel brakes are worked with compressed air. Goodrich-type rubber deicers are fitted to the wing and empennage leading edges, and fluid deicing is used for the airscrew, pilots' windshield, and air intakes.

Ample provision has been made for soundproofing, ventilating and heating the cabin. The necessary hot air is obtained from heating jackets surrounding the engine exhaust pipes, the centre engine supplying hot air for the cockpit, and the two outboard engines for the passenger cabin. As the " Monterosa " has no pressurised cabin, but is all the same built for flying in Alpine regions, oxygen masks are provided for all passengers.

The Fiat G 212 does not claim to compete with the newest American high-speed aircraft flying well-organised airways between big airports. Rather, it is meant to be an economic aircraft for flying under adverse conditions where the most important factor is not so much high speed as the ability to take off and land safely where airfields are primitive ; and in this latter respect even the well-proven Douglas DC-3 has nothing to teach it. Its operation is therefore best justified in cases where traffic volume is going ahead at a faster rate than airport development. The fact that the Italian aircraft industry is counting on such circumstances without exaggerated optimism, and that it prefers to build today an aircraft for present traffic conditions than to build a faster one tomorrow for the traffic of tomorrow, speaks well for its determination.

T.

Rigidity Problems in High-Speed Flight

Alongside the liberty in space, speed is the characteristic property of the aeroplane. It is its foremost technical property, and like every property of a technical product, it is constantly being developed and improved in accordance with a scientific law. Configuration, structure and propulsion of the aeroplane are factors of lesser importance than that of speed. Old standards lose in significance, new laws are discovered ; all serving the purpose of perfecting the aeroplane, thus primarily making it faster. As a result new problems arise, which cause the old ones to recede into the background and greater attention to be drawn to themselves. One of these problems is that of rigidity.

Strength and deformation are two things which are very closely related, for the engendering of tensions, which after all effect the transmission of forces, is only possible through deformations. Whether the ratio of the load to the deformation is large or small, i.e., whether the construction is rigid or not, is entirely dependent on the structural configuration of the specimen. To take an example, we can imagine that a tensile force is in one case transmitted by a rod and in the other case by a spiral spring, and that the cross-sections are suitably dimensioned so that both specimens can support the same maximum load. It is certain that the rigidity will be very much less in the second case than in the first one.

In the early days it was a practice in aeroplane construction to calculate the deformation only as a secondary consideration, or even to ignore it completely in the calculation, since the constructor or stress analysist knew from experience that the specific structural method also fulfilled the demands as regards rigidity. However, the situation changed when flying speeds augmented and aircraft parts were subjected to considerable supplementary loads arising from the displacements due to deformation. Supplementary loads are of course also present at lower speeds, but are so small as to be neglected ; at higher speeds, however, or at higher dynamic pressures, it is no longer permissible to neglect them.

In order to illustrate this fact with a simplified example (Fig. 1), let us imagine a structural specimen in which the elastic reaction P_e augments in linear proportion to the deformation f. (See line *a*.) Let us assume furthermore that the specimen, a wing for example, deforms under this load in such a way that the angle of incidence increases. Then the load will also increase owing to the air forces ; we thus have a load increasing with the deformation, as shown by line *b*. Equilibrium is attained when the outer load is exactly equal to the inner elastic reaction, thus at the intersection of lines *a* and *b*. Whilst at unvarying load the deformation amounts to f_o (dotted line), at varying load the final deformation is greater. The steeper the line representing the outer load, the greater the deformation at which the two lines intersect, even to attain infinity in the case where the two lines are parallel. It could therefore be imagined that a state of equilibrium does not arise, and that the wing folds up and breaks despite the fact that its strength is adequate for the initial load.

Let us proceed further and express numerically the law applying to our example. The line *a* is represented by the relation $P_e = c_e \cdot f$, whereby c_e gives the variation of the elastic reaction due to deformation.

Correspondingly, the line *b* is given by $P_l = P_o + c_l \cdot f$, if c_l expresses the load variation due to deformation. We can now define a multiple m of the deformation as the ratio of the effective deformation f to the deformation f_o due to the initial load alone, and by setting $P_e = P_l$ we obtain for this deformation multiple :-

$$m = \frac{1}{1 - \frac{c_l}{c_e}}$$

Where $c_l = c_e$ the external forces increase with the deformation exactly as strongly as the internal forces do, so that even in the case of infinite deformation, the load would be greater than the elastic reaction.

The factor of variation c_l of the load is now dependent on the dynamic pressure and therefore on the square of the speed, whereas the factor c_e mostly remains constant. If we again represent the deformation as a variation of the angle of incidence, then the air forces thus occasioned are proportional to the dynamic pressure. If we assume as example that at a flying speed of 250 km/h the deformation multiple $m = 1.10$, then it will already be superior to 5 at 750 km/h. The deformation multiple therefore increases very quickly with the speed and, in this example, would already attain infinity at the critical speed of 830 km/h. Fig. 2 represents the variation of the deformation multiple in function of the speed.

Meanwhile, it is also possible that the angle of incidence becomes smaller as a result of deformation. In this case the state of equilibrium is reached at a deformation inferior to f_o. The factor c_l is negative and the deformation multiple is inferior to 1. In such a case the structure would be reinforced to a certain extent by the load.

Fig. 1 : Curves of the external and internal forces in function of the deformation ; determining the deformation multiple m.

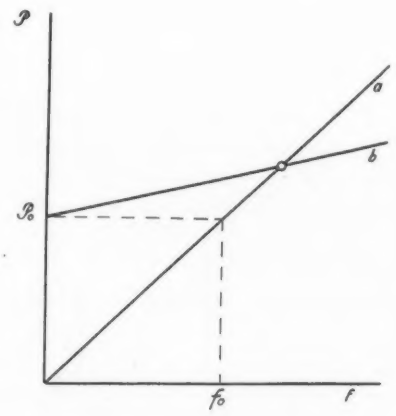
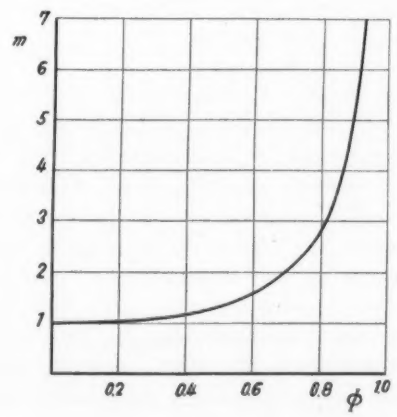


Fig. 2 : The deformation multiple m versus the ratio $\emptyset$ of the flying speed to the critical speed.

$$\emptyset = \frac{v}{v_{cr}}$$



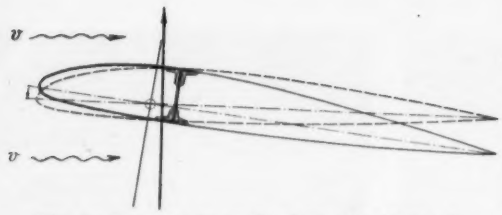


Fig. 3 : Decrease in angle of wing incidence due to increasing air forces ; the elastic axis is positioned well forward.

The handiest way of preventing supplementary loads due to deformation consists in increasing the rigidity. In the above formula for the deformation multiple this signifies an increase in the value of the factor c_e. Small aspect ratios and a large relative profile thickness are advantageous in this connection, but incur disadvantages from the standpoint of flight performance. The simplest means is of course to select thicker panels for the outer covering, but this entails penalties as regards weight.

Another method consists of making the factor c_l smaller, thus to seek out the roots of the evil. For this the most elegant way is doubtlessly to achieve a correct positioning of the elastic axis, thus the line about which the wing twists when undergoing torsional deflection. It is known that the mean air force acts at about 25 per cent. chord of a conventional wing profile. If we locate the elastic axis in exactly this position, the supplementary air force due to deformation cannot exercise a torsional moment about this axis, so that there is no further torsional deflection of the profile. If the elastic axis is positioned fore of the point where the air force attacks (Fig. 3), it is even possible to attain a negative torsional deflection. In practice, this method can be applied in single-spar constructions by suitably distributing the thicknesses of the panels along the wing chord. Conversely, the elastic axis can only be displaced forwards to a limited extent in the case of multi-spar constructions.

Flexure of the wing does not generally entail a variation of the load but it does cause a variation of the angle of incidence in the case of sweptback or sweptforward wings, which are precisely those used for fast aeroplanes owing to reasons of drag. If, for instance, the wing is sweptback and the flexure is directed upwards, the front part of the profile will be lifted less than the rear part. If the wing is sweptback the load is therefore diminished, and if it is sweptforward the load is increased.

Meanwhile, the rigidity does not only influence the strength, but also the flight characteristics. This is evidenced by the fact that the effectiveness of the ailerons decreases at high speeds. If the ailerons are lowered, the air force attacks the wing at about 50 per cent. chord and thereby subjects it to a torsional deflection which diminishes the angle of incidence. But the result of this will also be less lift, so that the increase in air force sought by lowering the aileron cannot completely take place on the wing and the desired speed of rotation cannot be attained. The loss in aileron effectiveness can assume such values that a rotation of the aeroplane about its longitudinal axis is no longer possible.

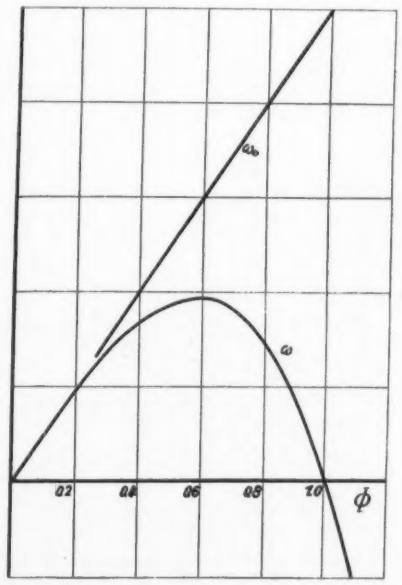
As will now be shown by a simple consideration, this effect, too, is dependent on the speed. Deflecting the ailerons causes a variation in the spanwise distribution of lift, which in turn occasions a turning moment about the longitudinal axis of the aeroplane. The resultant rolling motion engenders a vertical supplementary speed at each section of the wing, which together with the flying speed gives a resultant speed of which the direction deviates by a certain angle from the initial airspeed. This variation of the angle of incidence increases from the centre of the aeroplane towards the wing tips. Meanwhile, every variation in angle of incidence is coupled with a variation in the amount of lift furnished, which in our case acts in a sense contrary to the variation of lift arising from the deflection of the ailerons, and which tends to oppose the rolling motion. If this counter-turning moment, which is none other than the force which damps out the rolling motion, is exactly equal to the rolling moment produced by the aileron, the aeroplane will continue rolling at a constant angular speed.

In first approximation, the spanwise torsional deflection of the wing per unit of length can be assumed to be constant. Then the increase in angle of incidence due to the torsional deflection is exactly equal to the increase due to the rolling motion, and consequently it is necessary, in calculating the damping of the rolling motion, to add the angle of torsional deflection of the wing to the angle of damping mentioned above and calculated from the rolling speed, flying speed, and the position of the section under consideration. The effective angular speed of the aeroplane (ω) is therefore smaller than it would be in the case of a completely rigid wing (ω_o). Fig. 4 shows the principles of this relation. As can be seen, the decrease in effectiveness of the ailerons is of great importance ; the angular speed can even assume negative values once the critical speed has been exceeded.

Fig. 4 : Aileron " sogginess " in function of :—

$$\phi = \frac{v}{v_{cr}}$$

ω_o = Rolling speed with rigid wing at given aileron angle.
ω = Rolling speed, taking wing deformation into account.



As an empirical value for determining this critical speed, we can use the fact that the rolling speed (ω) becomes equal to zero when the angle of torsional deflection at the wing tip attains 30 per cent. of the angle through which the aileron is deflected. If, however, we wished to retain at least half the aileron effectiveness, then for an assumed aileron angle of 6 deg. the angle of torsional deflection would have to be less than 1 deg. We perceive therefore that the wing has to fulfil rather strict conditions of rigidity. The decrease in aileron effectiveness clearly illustrates the relation between speed and rigidity. The torsional deflection of the wing when the ailerons are actuated is occasioned by a couple of forces, consisting of the lift furnished by the lowering of the ailerons, and of the negative lift caused by the damping or deformation—and vice versa. For this reason the position of the elastic axis is far less important here. For maintaining aileron effectiveness, the wing must be made rigid, and this can generally only be done by choosing panels of suitable thickness.

A phenomenon which is related to the loss in aileron effectiveness is the loss in elevator effectiveness, though the latter action has hitherto never been as marked. It arises as a result of the flexure of the fuselage, which causes a variation of the angle of incidence of the horizontal empennage and, with it, a decrease in elevator action. Such a variation in elevator effectiveness is to the detriment of longitudinal stability. Apart from this, more movement has to be given to the elevator, which, depending on the structure of the control surfaces and the flying speed, can lead to certain difficulties in view of the necessarily high actuating forces, and this especially in pull-outs at high speeds.

In the case of each of these problems we have always spoken of high speeds, but all the same not of such in the vicinity of sonic speed. As is known, the points of attack of the air forces can shift very rapidly when the speed of sound is approached. What exactly will happen when the sonic barrier is pierced is still the task of current research. However, it may be assumed with certainty that in this connection the problem of rigidity will always remain in the foreground.

Dr. F. H.

Views on the Armament of Modern Fighter Aeroplanes

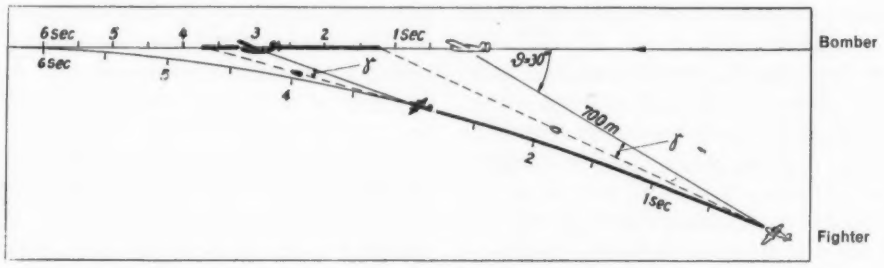
(Concluded)

By Gordon M. Gollob, formerly Colonel and Chief of Fighter Requirements, Luftwaffe.

VII. Advantages of an automatic-sighting device; adjustment of guns.

The object of the curves shown in Fig. 8 is to emphasise the significant advantage of an automatic-sighting device over a fixed type of sight. The exposition is based on the German EZ 42 automatic-sighting device which, provided the pilot measured the range accurately, furnished the correct angle of lead for flank and altitude. The supposition is that a fighter is attacking a bomber, and that the speed of the fighter is 200 metres per second and that of the bomber 100 metres per second; the attack is made once at an angle of 30 deg. (Ia, Ib and IIa, IIb) and once at an angle of 0 deg. (I and II). The curves with the index " a " refer to firing with an automatic-sighting device as already described; those with the index " b " relate to otherwise identical conditions, but assume the use of a fixed sight, permanently adjusted to 600 metres. The probabilities of destruction are presented as a function of the distance, the fire being constant during three seconds, for a "good shot" with a firing dispersion of 1 per cent. and a " poor shot " with a firing dispersion of 2 per cent. With regard to armament, it is assumed in all cases illustrated that the attacker is using 2 MK 108 automatic cannon of 30-mm. calibre, is firing high-explosive ammunition, and that four hits signify a 100 per cent. probability of destruction. In this case, experience has taught that for the curves with index " b " a definite mean lead dispersion (V_{50}) should be assumed.

In point of fact the probability curves shown in Fig. 8 will be less favourable for a

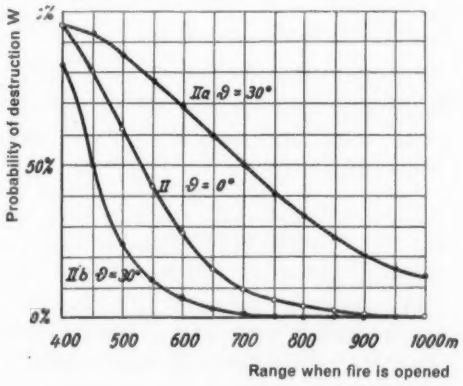


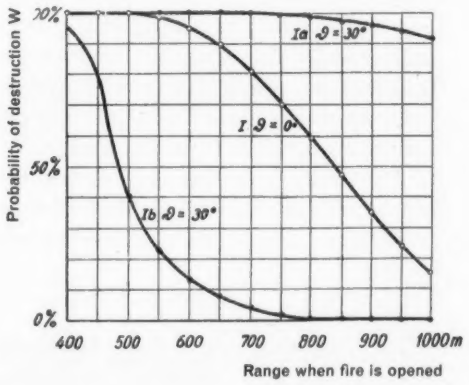
——— Flight path while firing (fighter) or being fired upon (bomber)
γ = Angle of lead

Fig. 8: Fighter (v_F = 200 m/sec.) attacking bomber (v_B = 100 m/sec.).

Probability of destruction W (4 hits) with constant fire of 3 sec. with 2 MK 108's, versus
range at the beginning of the constant fire
firing dispersion r_{50}
lead dispersion V_{50}
angle of flight ϑ at 700-m. range attacking from the rear, above or below.

The effect of counter-fire (combined probability of destruction) is not taken into account. Fixed sights adjusted to 600 m.





I. Good shot
r_{50} = 1 per cent.

II. Bad shot
r_{50} = 2 per cent.

Curves a: Approach with EZ 42 automatic-sighting device and correct range measurement
Curves b: Approach with fixed sights when V_{50} = 50 % and 25 %, respectively, of the necessary lead in both directions.

variety of reasons. This, however, is not of importance here, since we are concerned solely with making a fundamental comparison.

An instructive feature of Fig. 8 is the demonstration of the extent to which *W*, the probability of destruction, increases when an automatic-sighting apparatus is used. It is especially remarkable that a " poor shot " can still score a good *W* when approaching at as wide an angle as 30 deg., whereas experience shows that without automatic sights he is almost certain to achieve a bad result even at 20 deg. The comparison of approach flights below 30 deg., *with* and *without* automatic-sight, shows that a 50 per cent. *W* can be attained at 700-metres and 450-metres range. The *W* adjusted to 450-metres range amounts to 90 per cent. with automatic sights, compared to 50 per cent. with fixed sights. It follows that, if *W* is constant, firing is possible from a *greater range* with an *automatic-sighting device* than without one. This factor gains in significance when the attacking aeroplane is a decidedly faster machine than the target aircraft ; on the other hand, less danger to oneself is incurred if one opens the attack from a greater distance.

It has already been ascertained that, presupposing a sufficiently efficacious gun, *W* is dependent on the rate of fire *n*. A more efficient sighting-device enables a fighter pilot to open the attack from a greater distance, *W* remaining constant, but has no effect on the gun. However, the greater the attacking range with constant *W*, the less the risk incurred by the attacker. A better sighting-device therefore, other things being equal, serves only to lessen the danger to the attacker.

Nevertheless, the German EZ 42 gun sight was not 100 per cent. efficient. Another sight designed by the specialist engineer, P.O. Fuchs, was definitely superior to the EZ 42 in certain respects, but for unknown reasons was never put into production.

Logically, the guns must be adjusted with extreme accuracy, and convergent adjustment is certainly to be recommended. The point at which the trajectories of all projectiles intersect should be at the distance which practice has shown to be the average range at which successful attacks are opened ; for it is evident that, precisely at this moment, the pilot needs to have maximum concentration and accuracy of fire from all his guns.

VIII. Gun-sight-actuated trigger release ; target - tracking shells.

Solving the first problem can be of value in counteracting the disadvantage of the large ammunition consumption of modern rapid-firing guns. The trigger release actuated by the gun sight was under development in Germany and satisfactory results were obtained in experiments conducted by the Opta Company, involving a photo-electrical principle : salvo fire was used in a vertical upward direction, that is to say, when flying under the enemy aeroplane. The mechanism was known as the " optical eye " and was used in conjunction with Me 163 aircraft. This device, however, could not be subjected to any limitations of its function, as regards either the direction of approach or the distance from which the attack was opened. A minimal stipulation is that the mechanism should work accurately at all times, regardless of the direction in which the attack is carried out. In this respect again, P.O. Fuchs achieved notable results.

If, despite the fact that the pilot presses the trigger, *a projectile would only leave the gun when it had a great probability of scoring a hit*, it would suffice to carry only a fraction of the normal amount of ammunition. The resultant saving in weight and space would certainly have a favourable effect on the flying performance of the aeroplane, and it would be an easy matter to assess a sufficient amount of ammunition to be carried for any contingency, so that the wastage, hitherto so frequent, would no longer occur.

A gun-sight-actuated trigger release mechanism together with a fully-efficacious automatic-sighting device represents the optimum combination for successful fighter operations. A step further, meanwhile, would mean a " blind-firing mechanism, " an apparatus which would allow for accurate aiming without optical sights.

Target-tracking shells contain an apparatus which affects the trajectory in such a way that the shell follows the exact pursuit course until it contacts its target. It is important that such a shell should function in clouds and in darkness, and that its selectivity as regards the tracking mechanism's reaction to various targets should be great enough to prevent its changing over to another target.

IX. Choice and limitation of calibre and type of ammunition.

For aircraft guns with a high rate of fire and relatively low muzzle velocity it seems to me, as I have said already, that 30 mm is not only a particularly favourable calibre but also that it is the smallest calibre which can still have sufficient destructive effect on the target. The maximum calibre for aircraft guns would be that of a projectile sufficiently efficacious to destroy its target with one hit. Presupposing a special high-explosive shell, we can estimate such a calibre, taking our data from German experiments, at 50 to 55 mm.

A calibre of over 55 mm. can only be useful if the projectile is equipped with a time-detonator which can cause *destruction* while still a certain *distance away from the target*. Projectiles of this kind would in practice necessitate such large calibres that it can hardly be imagined how they could be fired from aircraft guns. Much more suitable in this case would be fully-stabilised rocket projectiles, guided by radio or other means of remote control. The maximum calibre for other rocket weapons is also estimated at 50 to 55 mm., if the assumption is made that only a direct hit can achieve destruction.

It is obvious that the kind of ammunition with the greatest destructive effect should be selected. Although we must take into account that the sturdiness of aeroplanes is increasing with development and that it can be greatly raised by the use of armour plating, it must not be forgotten that there is no unplated part of an aeroplane, however well constructed, which can resist projectiles with a calibre between 30 and 55 mm. Armour plating, however, can never cover more than a limited part of an aeroplane. In any case it seems impossible to protect all the fuel tanks efficaciously. It should be added that the proportion of fuel to the total weight of the aeroplane reaches a maximum when turbo- or rocket-engines are used. Such aeroplanes are naturally still more vulnerable.

Experience with German 30-mm. high-explosive shells and the 55-mm. high-explosive rocket (R4M) has convinced me that conventional high-explosive projectiles are quite sufficient for destroying the air targets of today and, presumably, those which will appear in the near future. For this purpose, then, *other kinds of ammunition can be dispensed with.*

To attack ground targets, however, particularly tanks, from the air, special armour-piercing projectiles are required, and guns of high muzzle velocity will evidently possess the greatest power of penetration. If, on the other hand, it is possible to manufacture projectiles with specially high armour-breaking efficacy, then the muzzle velocity can be reduced. Projectiles incorporating the principle of the Bazooka are particularly suitable here, both for guns and rockets.

In my opinion there is no longer any valid reason for employing tracer bullets. Indeed there are many disadvantages connected with them.

It will thus be seen that of the diverse types of ammunition employed during the War quite a number could be scrapped. That such a limitation to a few kinds of ammunition would simplify the problems of production and supply need not be further emphasised.

X. Comparing 55-mm rocket armament and 55-mm cannon.

Although a certain amount of preference should be accorded the 30-mm. calibre, there is also a desire for a greater calibre, of 50 to 55 mm., for the purpose of destroying large-size air targets with one hit. One can choose between a cannon of the calibre mentioned and a rocket weapon of equal calibre. Which of the two is preferable can be ascertained experimentally. To illustrate this problem with a concrete example, I will compare two German types of weapon here, the MK 112 cannon and the rocket automat. Both have the same calibre and the same rate of fire. The table below shows the figures which are important for the purpose of comparison.

	Calibre	Rate of fire/min.	Weight of weapon	Velocity of projectile	Explosive charge	Full belt with 100 rounds
MK 112	55 mm	300	270 kgs.	600 m/sec. (v_0)	420 grs.	285 kgs.
Rocket Automat	55 mm	300	23 kgs.	520 m/sec. (v_{max})	500 grs.	400 kgs.

As far as the rocket automat is concerned, except for the ammunition these are only project data.

While the weight of the cannon together with a hundred rounds of ammunition amounts to 555 kgs., the weight of the rocket automat and its ammunition (100 rounds) is only 423 kgs. The weight of explosive in 100 rounds of rocket ammunition is 8 kgs. more than that in 100 rounds of cannon projectiles. Then there is no recoil with rockets. This advantage is offset, however, by the inferior ballistics (but still comparable with the cannon) of the rocket. For this calibre, nevertheless, the rocket automat is *preferable to the cannon* mentioned above.

If it is a question of the highest possible v_0, however, the rocket must take second place.

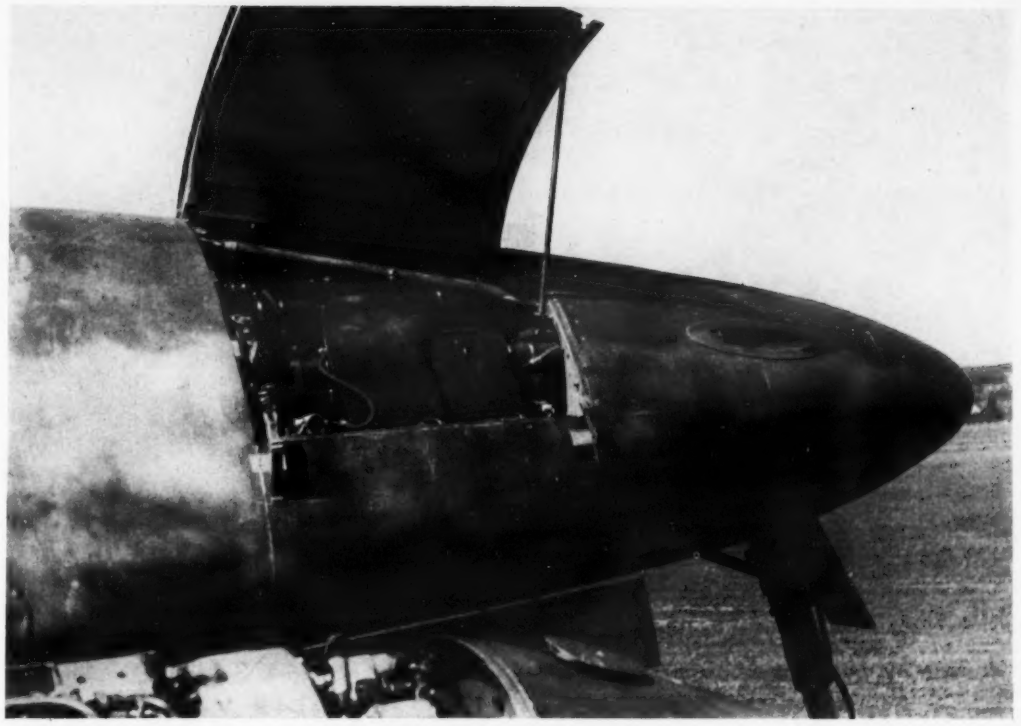
It should be mentioned that a rocket automat has certain advantages over a cannon when it comes to fitting it to the aeroplane.

Here is clearly a way to obtain practical 55-mm. weapons and at the same time to avoid all the disadvantages connected with cannon of this calibre.

The *shot-type* ammunition used in R4M rockets of 55-mm. calibre, 24 of which equipped the Me 262, produced excellent results ; which seems to confirm that, *in the 50-mm. rapid-firing group, rockets are superior to cannon of equal calibre.*

XI. Long-range guns for aeroplanes.

Here we enter a domain which is definitely ruled by the achievements of engineering,



Messerschmitt Me 262: Installation of the four MK 108 30-mm. cannon.

and where the pilot himself can contribute little towards the success or failure.

Long-range aircraft guns are expensive both to develop and to manufacture. Their use can only be worth while if they enable more success to be obtained on the average than normal armament, and this at a greater distance away from the enemy than otherwise, that is to say, at less danger to oneself.

If long-range guns were to fire target-tracking shells, so that a pilot only had to bring his gun into the vicinity and flight direction of the target, then it could be said that the fighter aeroplane had been degraded to a mere means of transport. This could not fail to have its effect on the development of fighters equipped with armament of this kind.

XII. Summary and Conclusions.

There are still a number of factors, outside the scope of this article, which would probably affect the efficacy of aeroplane armament, and which will be dealt with in detail on another occasion.

A summary of the foregoing leads to the following conclusions :-

1. Assuming sufficient efficacy (calibre), the rate of fire is the decisive factor as regards the probability of destruction W. In this respect 30 mm. is a particularly advantageous calibre. Firing with a spray of shots corresponds to guns with a high rate of fire.

2. Increasing calibre and greater muzzle velocity decrease the rate of fire and, in consequence, the probability of destruction.

3. Increasing calibre and, particularly, high muzzle velocity increase the weight and bulkiness of the gun considerably.

4. Mere raising of the muzzle velocity is not a suitable way of increasing the attacking range, since it means lowering the probability of destruction.

5. Experience has shown that the firing dispersion of a gunner is between ten and twenty per cent. in the case of constant fire. It is reduced to about half these figures when shots are aimed singly. A singly-aimed shot must therefore entail a relative increase of W.

6. A gun with very high muzzle velocity and therefore low rate of fire can, if shots are aimed singly, in certain circumstances enable a higher W to be achieved than in a case of constant fire and low rate of fire.

7. If shots are aimed singly, a gun with very high v_0 can only be successful over long ranges provided the problem of aiming at such distances has been completely solved.

8. The changes in ballistics as a result of the decrease in air density with altitude

and owing to the aggregate effect of the aeroplane's speed and the v_o, must be borne in mind when aiming.

9. A calibre of 50 to 55 mm. is sufficient for destroying large air targets with one hit if suitable ammunition is used.

10. An automatic sighting device, eliminating dispersion factors as much as possible, is an absolute necessity if W is to be increased. If W is constant an automatic-sighting device reduces the danger to the attacker, in that it lengthens the distance from which he may open the attack.

11. As flight angle and speed differential in relation to the target aeroplane increase, the accelerations occurring in the pursuit curve and the ranges at which the attack may be carried out increase considerably. In the case of flight angles of more than about 20 deg. there is little likelihood of success unless an automatic-sighting device is employed.

12. The development of a gun-sight-actuated trigger release and of target-tracking shells should be fostered energetically.

13. As ammunition for cannon and rockets equipping aircraft, special high-explosive shells are, in my opinion, adequate now, and will be for a long time, for combatting air targets, provided the hits are direct. Experience has shown that four hits with a 30-mm. high explosive shell are enough to destroy an air target of the size of a " Flying Fortress. "

14. For attacking ground targets a gun with great power of penetration is necessary. This ought to be attained by developing the ammunition in this direction, rather than by raising the muzzle velocity.

15. Provided a high v_o is not required, a rocket automat of the 50-mm. class is preferable to a cannon of the same calibre.

16. The advent of an ideal long-range gun for fighters would radically change the future character of air warfare and turn fighter flying into a transport undertaking.

As a result of the above it can be stated with confidence that the aeroplane must be developed to suit the armament and *not* the armament to suit the aeroplane. The enemy is not shot down by the aeroplane but by the gun in the aeroplane. Therefore the main object, the armament, must come first, and in the second place the means, namely the aeroplane.

First, therefore, the extent and nature of the armament must be decided on, taking into consideration the expected armament strength of the enemy and other requisites dictated by tactics. Only *afterwards* can we begin to construct an aeroplane which must also meet the other demands.

The objective being thus made clear, there must be an optimum solution to the problem of combining the armament *and* the aeroplane, which is within the bounds of technical possibilities. It must likewise be clearly realised that the closest co-operation is needed between armament specialists, aeroplane designers and military experts to find this optimum solution, but that it can never be attained without compromise. Compromises, however, must not wander too far from the fundamental principle, i.e., the armament required.

Renaissance of the Aircraft for the Masses?

The fanatics of ornithopter flight and of the aircraft for the masses can be traced back to the very earliest days of the history of flight. A study of the question reveals that the smallest possible, individual flying machine has been urged right through the ages, first by the ancient poets and later by scientists and inventors. The more recent pages of history tell of experiments by numerous hard-headed enthusiasts of all ages and nationalities, who tried and tried again in the face of severe disappointments and setbacks.

Their desire is very understandable. For no sooner had the problem of flight been solved in principle, than entirely opposed camps took possession of the new invention. Today we have at our disposal huge transport aircraft for hundreds of passengers, driven by ten thousands of horsepower; we have fighter aeroplanes of which the perfection places them in the category of flying laboratories. But the disciples of the light aeroplane have received practically no answer to their dreams. True, so-called "aircraft for the masses" have cropped up from time to time, which, driven by midget engines, were to have provided the illusion of flight, but which mostly disappeared again very quickly. And a doleful tale could be told of the many who lost their last penny, paid for their courage with their limbs or their lives, and finally lost all taste for flying of any sort.

The primary inspiration of flyers has always been the bird. Not only has man always tried to wrest from the bird the secrets of the flapping wing, but he used to admire it because of its apparent small need for energy with which to fly. But it has been recognised in the meantime, however, that the work performed by the bird in relation to its weight is far greater than that applying to humans. Despite this, there are still inventors today who are either endeavouring to emulate the bird and fly with muscular force, or trying obstinately to become airborne in flying machines fitted with hoplessly inadequate power plants. They are to be found in every sphere of aircraft development—from the ornithopter by way of the fixed-wing aeroplane to the rotating wing craft—and never have they become tired of offering new suggestions.

At the present time the rotating wing is awakening new hopes. The question is whether an age-old dream is to find fulfilment in this sphere. We give the floor to the inventors.

Fig. 1: Strap-on "Heliofly" helicopter designed by Paul Baumgartl, just before being started for the jump-off.

The "Heliofly."

This new flying machine, shown together with its constructor, P. Baumgartl, in Fig. 1, is typical of the new trend, not so much because of its design and present purpose, but owing to the optimistic hopes of its inventor. For the time being it is described as a "back-strap, jump-off autogyro," and is therefore a rotating-wing glider that is capable of taking off on its own power. A Garelli engine of 4.2 H. P., running at 6,000 r. p. m., spins the approximately 20-foot-diameter, two-blade rotor at 500 r.p.m. As soon as this rotor speed has been reached, the blades are adjusted to a higher pitch and the motor declutched. This enables the "Heliofly" to jump off the ground

Fig. 2: The "Heliofly," shown here on a stand, has its rotor spun to take-off speed by a four-H.P. Garelli engine, which can be declutched.

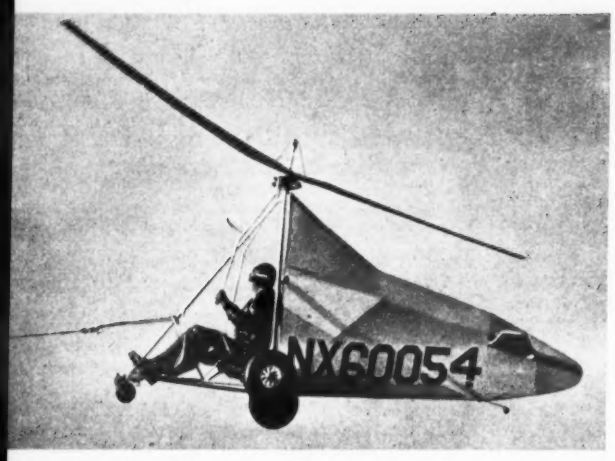


Fig. 3: The General Electric "Gyro-Glider" in tow behind a jeep.

Fig. 4: Focke-Achgelis FA 330 observation "Rotorkite" for use from U-boats.

Fig. 5: In emergencies, the three-blade rotor of the FA 330 can be jettisoned, whereupon a parachute opens out behind the pilot.

and—if the terrain is suitable—to glide down with autorotation. During this operation the angle of blade pitch should be about 6 deg. and the rotor speed 300 r.p.m. Prior to the jump-off, the pilot should have enough strength in his legs to take up the back-torque moment of the rotor, which, as long as the engine is in gear, is subject to no torque cancellation. During the glide, only a decreasingly smaller frictional torque moment occurs. For the flight control, a periodic pitch change is provided. In the opinion of the inventor, the landing need not absolutely be tied up with a smashed rotor and a couple of broken legs.

With his "Heliofly" it was obviously not the inventor's intention merely to create a novel aspect of sporting flying. The conception of the autogyro-glider as such is, of course, not new—the only real novelty is its combination with its jump-off start derived from the autogyro. In this connection we draw attention to the "Rotor Chute" which was developed in England during the War on the basis of ideas by Bruce Williams, Raoul Hafner and Dr. J.A.J. Bennett, for "spot landings" by parachute; and to the British patent for a rotating-wing parachute of Vitt. Isacco. Rotating wing kites have been built for towed take-offs both over land and water. A good idea of what these constructions look like, and how they work, can be derived from the photo of the U.S. "Gyro-Glider" of General Electric, which is shown in tow behind a jeep, and that of the German "Rotorkite" (Focke-Achgelis FA 330), which served the purpose of a "flying crow's nest" for moving U-boats (Figs 3-5).

Meanwhile, it may be noted that the inventor of the jump-off autogyro seems to be indulging in "greater expectations"—he hopes that it will evolve into a "helicopter for the masses." His plans foresee a strap-on helicopter fitted with a more powerful engine, which—as he has repeatedly had announced by the more credulous sections of the press—will not only be capable of executing vertical take-offs and landings, but also of travelling at over 60 m.p.h. through the air.

The "Hoppi-Copter."

An American designer, Mr. Horace T. Pentecost, of Seattle, Wash., also began with a strap-on apparatus. Very aptly, he dubbed it "Hoppi-Copter." Meanwhile, he employed a 20-H.P. engine and contra-rotating rotors for anti-torque, right from the start. But, in the meantime, a mechanical undercarriage has had to be added in order to protect the human element, so that the empty weight has risen from 88 lbs. to about 175 lbs., and the propulsive power to 40 H.P. The development stages involved are extremely informative as regards the race between empty weight and engine power, and thus for the prospects of the helicopter for the masses. The table

Fig. 6: The first strap-on version of the "Hoppi-Copter," driven by a 20-H.P. engine.

Fig. 7: The experimental version with undercarriage still has the 20-H.P. engine and has therefore not the strength to "hop."

below compares the most important data in this connection ; those printed in italics are taken from documentation supplied by the manufacturers—Hoppi-Copter, Inc., Seattle—whereas the others are our own estimates :

Version	I Strap-on Model	II Experimental Model	III Design for Production
Max. engine power..... H.P.	*20*	*20*	*40*
Undercarriage.. —	—	simple (without springs)	reinforced (with springs)
Gross weight .. lbs.	242*	275	440
Empty weight.. lbs.	*88*	121	187
Pilot + fuel.... lbs.	154*	154	*253*
Rotor diameter . ft.	*12*	*13.5*	*16*
Rotor disc area . sq.ft.	*113*	*143*	*202*
Disc loading lb./sq.ft.	2.14	1.92	2.18
Continuous power (at most 75 % max. W)..... H.P.	15	15	30
Continuous power loading... lb./H.P.	16.15	18.35	14.65
Hovering index** —	8.25	8.70	7.75
Flight duration. hrs.	according to weight of pilot		1+1.5 hr.
Cruising speed m.p.h.	50*	50*	75*
Ceiling..... ft.	10—300*	10—300*	6,500—10,000*

* Data given by manufacturers are considerably higher.

** The hovering index $\left(\sqrt[3]{\frac{G}{W} \cdot \left(\frac{G}{W}\right)^2}\right)$ must be below 9 for normal efficiencies of rotor and gear at sea level, and below 8.2 at 10,000 ft. altitude ; the lower the better.

With the gross weights taken as low as possible, it may be assumed that the two first experimental models can just manage to hover or fly forward at continuous engine power at sea level. The disposable load of only 154 lbs. is doubtlessly inadequate. The design projected for production (III) seems to suffice as regards disposable load, but flight duration, climbing ability and ceiling only barely make the grade.

The accompanying photographs show how the construction of the "Hoppi-Copter" has progressed. The strap-on version shown in Fig. 6 calls for a pilot who is sound in wind and limb, for an 80-lb. pack is apt to strain the back of the sturdiest mountain guide. The experimental version shown in Figs. 7 and 8 with the designer, Mr. Pentecost, at the controls, is equipped with a rigid undercarriage ; and one feels like ducking when one thinks of the revolving rotor blades. The production project featured in Fig. 9 certainly makes a better impression. The undercarriage is equipped with elastic shock chords, attached in the plane of the bracing wires. Each spruce rotor blade, which has a metal leading edge, is attached to the actual hub through a tubular centre-piece of steel, about 2 ft. long, and is approximately 5 inches wide. As the lower rotor is about 6 ft. above the ground, the pilot can stand up almost straight for starting the engine, mounting and dismounting, without the risk of having his head chopped off.

All three models feature a two-stage bevel gear of an approximately 10 : 1 ratio between engine and rotor, a manual direct-engaging clutch, and an overriding clutch for auto-

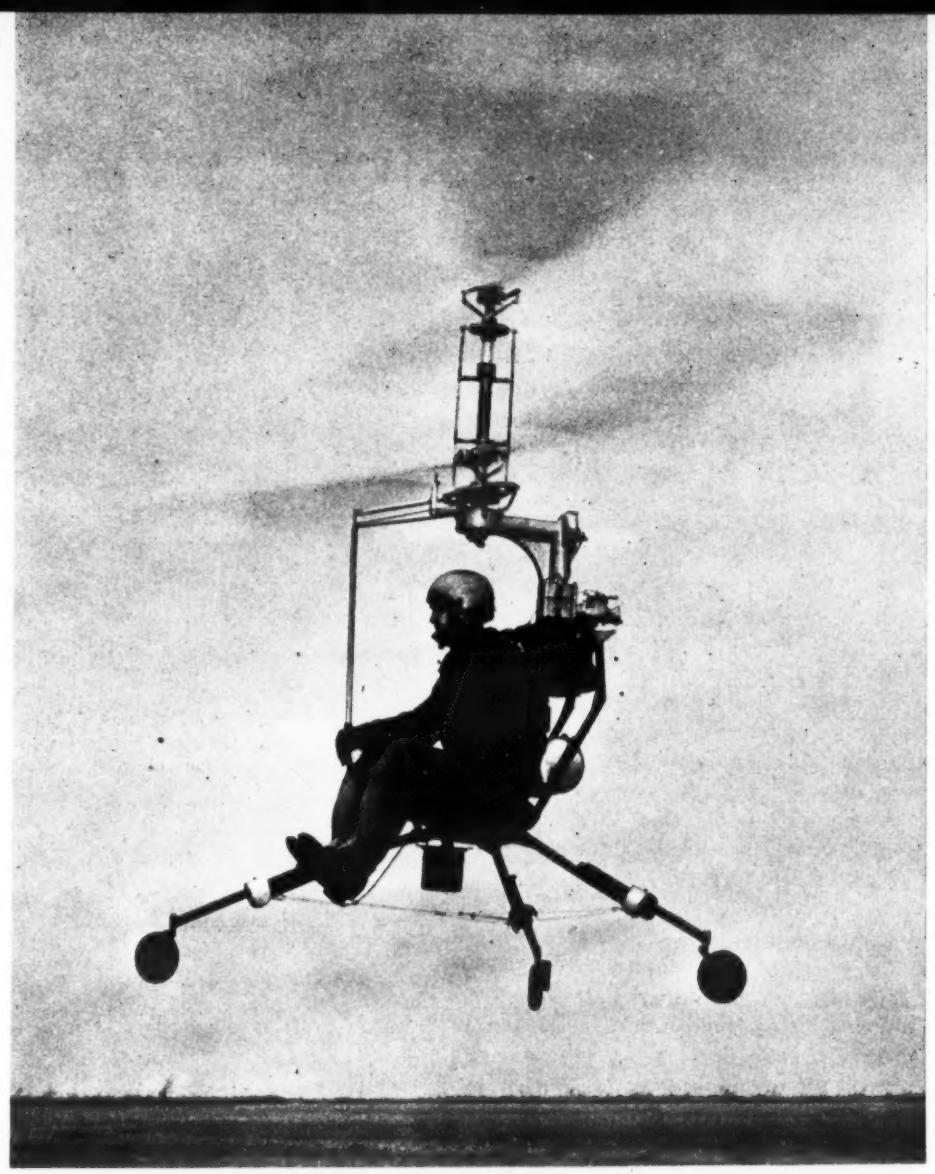
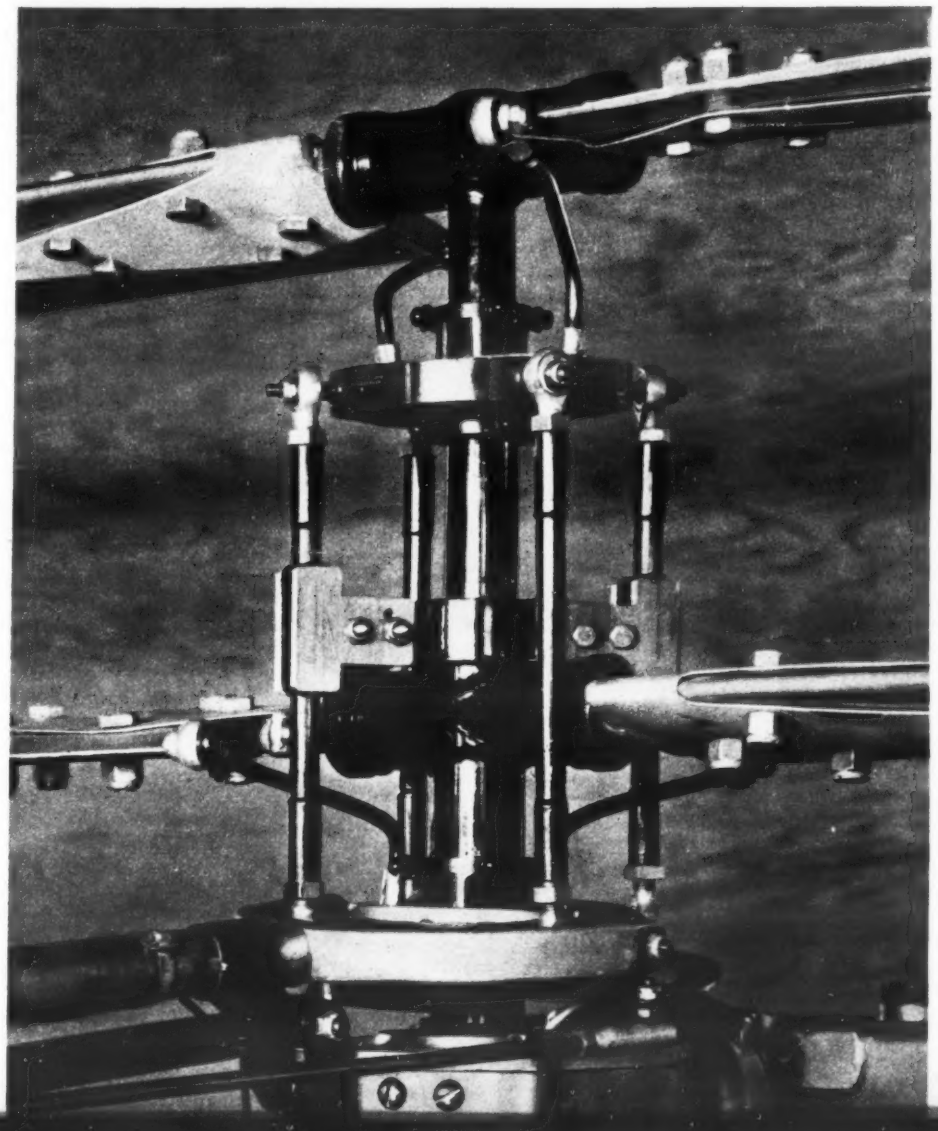


Fig. 8 : The "Hoppi-Copter" needed 30-40 H.P. before it could really fly.
Fig. 9 : The rotor head of the "Hoppi-Copter."



rotation when the engine is throttled down. At an engine speed of 4,000 to 5,000 r.p.m., which represents the speed for continuous power, the rotors would therefore turn at 400 to 500 r.p.m. There is a flywheel-fan for cooling the cylinders, and a rope wrapped around the fanshaft is used for starting the engine.

The control is interesting. A hanging "stick" can be lifted and pulled downward, tilted forwards, backwards and sideways, and also twisted. Lifting and pulling down alters the pitch of the rotor blades *collectively* to larger or smaller angles ; the tilting movements are for *cyclic* pitch control ; by twisting the stick the anti-torque action is offset, so that the "Hoppi-Copter" then turns about its normal axis. All control movements can be executed separately or simultaneously. Fig. 10 shows how the rotor head is built up. Roller bearings, which can tilt and also move along grooves running the length of the two rotor shafts, serve the office of swash plates and simultaneously allow for a sliding motion for the collective pitch change. The lower bearing race has three rings, of which the centre one can slide upwards and downwards. This play, which is actuated by twisting the stick and by a thin metal rod, allows for the angle of pitch of the lower rotor blades to be altered, and thus the torque cancellation to be influenced.

Although it has emerged from the fledgling stage, the "Hoppi-Copter" is still an experimental machine. It remains to be seen how the design projected for production will turn out, and what improvements will be required. There is no doubt that this baby helicopter thoroughly deserves the interest which it is evincing. Meanwhile, however, whether a helicopter fitted with a 40-H.P. engine, reduction gears, contra-rotating rotors, fairly complicated blade-pitch control, etc., can be called an aircraft for the masses, is a matter of opinion. The engine alone, if it is to be airworthy, will cost somewhere in the vicinity of $1,000, and it is to be assumed that the entire machine will cost at least twice this amount. This is certainly too much for the man in the street. A safe guess is that a sales price equal to that of a good motor cycle, for the production version, will not go beyond being a cherished desire of the manufacturers for some time to come. On the other hand, it is more than likely that it would be possible to build it at a lower cost than any of the helicopters produced so far—which usually cost over $10,000 for each passenger seat they provide.

It is also sure that the "Hoppi-Copter," in its latest version, represents the smallest piston-engined helicopter capable of flying. But one tends to deduce from the data so far published that a 40-H.P. engine is not sufficiently powerful. This can also be explained theoretically, on the basis of

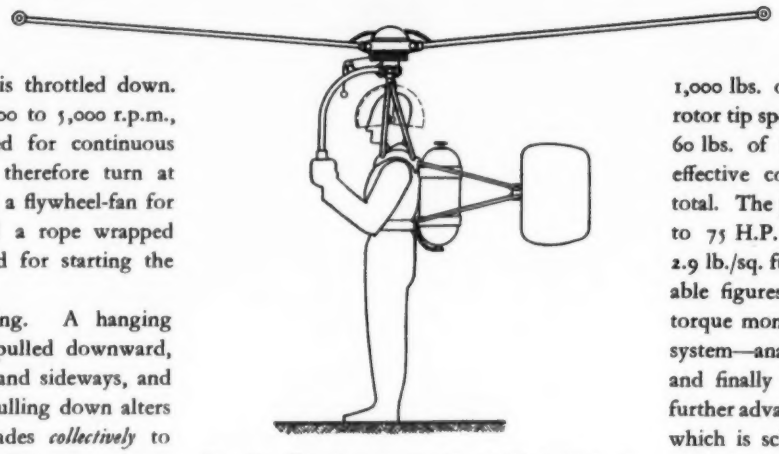


Fig. 11 : The strap-on ram-jet model designed by Dr. Just and W. Fleck.

considerations presented in earlier issues of this magazine.[1]

It is therefore not the saving in energy, but the far-reaching exploitation of energy sources, creation of light-weight energy sources, and cheaper methods of construction which point out the way ahead. Experts have long been in agreement that the systems of propulsion and control must be simplified if helicopters are to find a wider market. In this connection, Mr. Pentecost has furnished an interesting contribution ; just as McDonnell engineers have done with their small ram-jet helicopter, the "Little Henry." [2]

Do Other Possibilities Exist ?

Marquardt Aircraft Co., of Venice, Calif., is endeavouring to adapt jet propulsion to helicopters in the simplest possible manner, and has proposed a design which forces a fuel-air mixture under a ram pressure of 2.5 lb./sq. in. into hollow rotor blades, where, by centrifugal force, the pressure is raised to 30 lb./sq.in. The mixture is finally ducted through a perforated flame guard before entering the pressure ducts, where it is ignited by sparking plugs (Fig. 11). With the 21-foot two-blade rotor giving an effective solidity of 4.5 % and turning at 530 to 550 r.p.m., 1,000 lbs. of lift-thrust are produced. At a rotor tip speed of 600 ft./sec. the ducts develop 60 lbs. of thrust each, corresponding to an effective continuous output of 131 H.P. in total. The power loading would only amount to 75 H.P. and the disc loading to about 2.9 lb./sq. ft.—which are certainly very favourable figures. The cancellation of the back-torque moment, the extremely simple control system—analagous to the "Little Henry"—and finally the self-starting of the rotor are further advantages of the Marquardt helicopter, which is scheduled to undertake its first test flight shortly. The cruising speed is calculated at about 90 m.p.h., but the fuel consumption will be about twice as high as it would be if a piston engine of the same power were used.

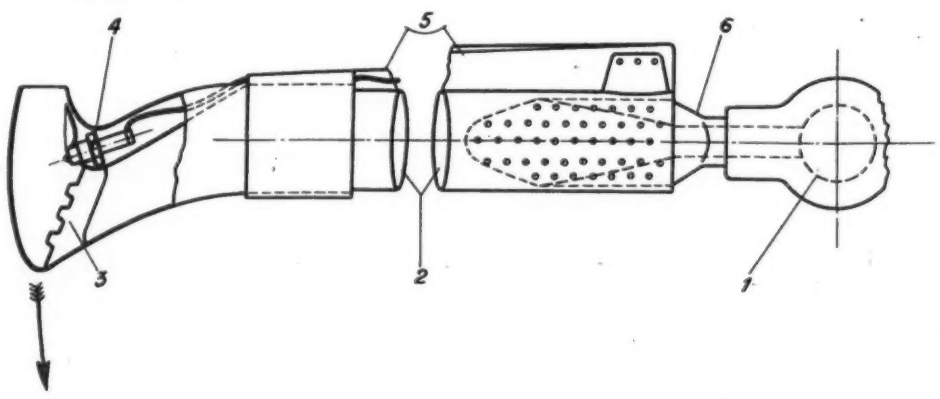
In this connection mention may be made of a further design for a small military helicopter driven by ram jets : the strap-on JF 1 helicopter designed by two engineers in France, Dr. Just and W. Fleck, shown in Fig. 12. It is built up as follows : three-blade rotor of 16 ft. diameter and 212 sq. ft. disc area ; gross weight of 230 lbs. and an empty weight of 55 lbs. ; three ram jet units each developing 13 lbs. of thrust. Assuming a blade tip speed of 600 ft./sec., the effective continuous output would be 42.5 H.P. ; the power loading attains 5.4 lb./H.P. and the disc loading 1.1 lb./sq.ft. The designers therefore expect fairly high altitudes, around 10,000 ft., and speeds of about 60 m.p.h. with 44 lbs. of fuel taken "on board" for a 23 min. duration. The fuel—probably gasoline—is sent by compressed air through the hollow rotor blades and, by centrifugal force, into the Lorin-type ducts at the tips. Built-in starting equipment is provided.

This design may be judged to have better prospects than any of the similar attempts with piston engines. As a result of the ram-jet means of propulsion and the simple structure, the empty weight is lower than in the case of the first "Hoppi-Copter" design, despite the fact that the power is three times as high. Meanwhile, however, if one thinks of the strain placed on the pilot at the landing,

[1] Cf. *Dr. W. Just* : "Performance Calculation for Helicopters" in "INTERAVIA, Review of World Aviation," No. 3, March, 1947, P. 56, Fig. 2.

[2] "INTERAVIA, Review of World Aviation," No. 2, February, 1948, P. 84-86.

Fig. 10 : Rotor blade with ram-jet propulsion, as designed by Marquardt Aircraft Co.
1) Mixture supply. 2) Hollow blade spar. 3) Inconnel burner with flame guard. 4) Sparking plug. 5) Trailing edge. 6) Attachment fitting.



the scales seem to tilt in favour of the constructions proposed by McDonnell and Marquardt.

The question now is whether all possibilities have been exhausted ; and the answer is "no." One only needs to recall to mind that gas turbines, too, have a relatively low specific weight, and are therefore not only advantageous for driving airscrews, but also for rotating wings. All the same, the lowest power limit for airscrew-turbines is still around 200 H.P. In this category comes the Boeing Model 502 turbine, which weighs 140 lbs. and therefore has a specific weight of 0.70 lb./H.P. [3] There is no doubt that, sooner or later, we shall see turbine-driven helicopters.

The title of this article sets the question of whether this is the renaissance of the aircraft for the masses that we are witnessing. Well, it is certainly not that for the present. There is no denying that every constructional simplification and new utilisation of jet or airscrew-turbine propulsion means better prospects for popular rotating-wing aircraft. But, apart from the rather high sales prices, it must not be forgotten that successful helicopters are of a recent era and, as they are conceived today, require a fair amount of skill on the part of a pilot. *Ri.*

[3] "INTERAVIA, Review of World Aviation," No. 8, August, 1947, P. 40-42.

Wot, no Aeroplanes?

A railway station on a main motor road, a marine harbour at the foot of Mont Blanc or a city street covered with railway lines would look strange, don't you think ?

These are some of the improbabilities which occured to me the other day when I visited the Paris Airline Terminal, erected on the Esplanade des Invalides, right in the centre of the city.

Indeed, every kind of transport is to be found there : buses, boats on the Seine about ten yards away, electric trains going to Versailles and the suburbs ; in fact every conceivable means of transport except—aeroplanes. And yet in this immense hall, with its immaculate white walls, its endless varnished counters, its floor covered with chaste red linoleum, the aeroplane really pervades everything.

The clerks look as if they had just been carefully taken out of boxes. They haven't that crumpled look by which railways workers, through a remarkable feat of mimicry, invariably manage to suggest the discomforts of a railway journey. Their appearance gives you a real appetite for luxurious travel.

The huge timetables, too, can only be contemplated if you accept the miracle of aviation. Names dance before your eyes : Ankara, Antananarivo, Oslo, Buenos Aires, Calcutta, with the time of departure after them ; it all looks as simple as taking a trip out of town for an afternoon in the country. Yes, that's certainly one way in which the aeroplane breaks down all geographical barriers.

Beyond the columns of figures and names of towns at the other end of the world, there was another intriguing series furnished with queer names : Mofri, Tuwethusa. I wondered if I had forgotten all my geography and I was just going to ask what they meant when enlightment suddenly came. Mofri means Monday and Friday and Tuwethusa, Tuesday, Wednesday, Thursday and Saturday. The aeroplane is busy breaking down language, too.

And then there were the porters, as typical of aeroplanes as anything could be. Instead of beefy men, as broad as they are tall, such as you see at railway stations and harbours, in the habit of heaving two-hundred-pound trunks on their imposing shoulders, you see slender, supple figures in blue overalls without a patch or a stain : just like animated dummies from the show window of a ready-made clothes store.

But let us go down to the waiting room. By the way, to add to the charming atmosphere of unreality here, the moment you prepare to go up in the air you begin by going down.

You must have been in railway waiting rooms before now. Novels, poems, dramas have been written about these queer places. As soon as you go in you are enveloped in their sordid and pitiful atmosphere. However well-groomed you may have been, soon you are slumped on a seat, either of the hardest wood or of horribly soft plush concealing squeaking and uneven springs.

Nothing like this in this simultaneously subterranean and aerial waiting-room. Its windows are decorated with muslin curtains. Super armchairs accommodate smart men and women bound for Rio de Janeiro, but looking as if they were just going out to have lunch at the Ritz.

The walls are covered with paintings depicting transport throughout the ages. First, there is the Marathon runner, with his hair perfectly parted, descending a green slope in the direction of the Acropolis. Next you have a Princess out of the Arabian Nights, languidly entrusting herself to a couple of muscular black bearers. Then, after a succession of idle-looking kings, we arrive at a XVIIth Century lady being carried in her sedan by lackeys in green livery. By way of the stagecoach and the landau we come to the first railway and an antedeluvian motor-car patronised by a gentleman in a purple overcoat and his lady friend in a billowing mauve skirt.

At last comes the aeroplane. Its nose points towards the nudes on the wall and, just below, my nose is pointing towards the bar ; a well-stocked bar, I may say, where much more interesting experiments on stability and instability can be made than in the air.

But a loudspeaker, which curiously enough can be understood, is calling travellers for Marseilles, Zurich, and Tunis to their respective buses and in a few minutes they will be taken to Le Bourget or Orly.

There go the buses. They all look terribly alike. If I were going to use them I should be horribly scared of getting into the wrong one.

It is tiresome enough to arrive at a railway station which is in exactly the opposite direction from where you wanted to go, but with an aeroplane the mistake would be disastrous. Think of landing at Brazzaville when you have a date in Copenhagen.

But, at the rate we are progressing, that is nothing to what may happen in a few years' time. We shall be able to hear a conversation like this :

"You're an hour late, my dear man."

"Sorry, old boy, I slipped up a bit. I thought I was going to Mars but I arrived at Saturn, and to get back I had to change at Jupiter."

But you may be sure that Venus will cause the most trouble !

Yves Grosrichard.

The Problem of the Freight Glider

BY THE LATE S/LDR. R. KRONFELD, LONDON

On the eve of his last flight, Robert Kronfeld, who crashed to his death on February 12th, 1948, sent us this article. In it he answers a question which has repeatedly been raised in aviation circles and one in which he, as an expert on tug combinations, was especially engrossed. It is our privilege to publish the last contribution from the pen of such an eminent expert.

In view of the success of heavy gliders in military operations the question is often asked whether the freight glider would not be suited to peacetime work. That the general public takes an interest in this problem can be deduced from what we read from time to time in the daily press about "air trains," and the advantages they might offer.

To unhook one or several air trailers when passing over, or near, branch-line airfields whilst the main load goes on without landing, would no doubt save a lot of time and trouble. If the process could be made workable in reverse by adding trailers in flight, using suitable pick-up methods, the scheme would be still more attractive.

Why is it, then, that the idea of glider trains has seldom gone beyond the stage of wishful thinking and at best has only led to certain isolated experiments ? The answer lies within two main considerations : limitations imposed by technical problems ; and the decisive question of pounds, shillings and pence.

Although the towing of one or two heavy gliders was successfully developed during the War, the problem of the air train proper could not be solved, notwithstanding the imposing sums available for development and experiments. Even more than with road transport, it was found that the difficulties increased by leaps and bounds when more than one trailer was towed by one towing unit ; and pick-up technique still needs to be developed quite a bit before it can be reliable under all conditions, even for operations with single gliders. For the time being, therefore, we have to restrict our considerations to simple tug-glider combinations.

Air transport, as we know it today, did not become a practical proposition until the problem of blind flying had been solved. The same applies to towing combinations. Only the development by the British during the War of the cable angle indicator, the blind-towing instrument for gliders, could reply to one of the main arguments raised against towed flight by airline operators. Another objection concerns the difficulty of handling gliders on the ground : aircraft which cannot manoeuvre under their own power on the flying field would be serious obstacles on normal airports. For this purpose, small auxiliary power plants solely for taxiing have been suggested. This could easily be arranged where a tricycle undercarriage is fitted, and a power-driven, steerable nose-wheel would provide the necessary manoevrability.

One of the few glider types for which the problem of ground control has been solved fully is the powered "Hamilcar" built by General Aircraft Limited. The two Bristol "Mercury" engines fitted to this aircraft not only serve to improve full-load take-off and rate of climb of the combination, but also give sufficient power for solo-flight with a limited amount of freight, independence from ground-handling parties, and full-time taxi services before and after flight.

The "Hamilcar," therefore, presents an appropriate example for our considerations.

The load-carrying capacity of the glider alone is 17,500 lbs. for payload and 21,280 lbs. for actual disposable load, consisting of fuel and oil, plus freight. The greatest advantage of the "Hamilcar" lies, however, not in the load carrying capacity as such, but in the ease of loading and unloading combined with the large, unrestricted space available. Measuring 1,440 cubic feet, the hold is 27 ft. 2 ins. long., 6 ft. 8 ins. high and 8 ft. wide. The actual freight space available is considerably greater but the main spar restricts the height locally. The cargo hold is easily accessible through the nose door, and elaborate loading ramps are not necessary. To facilitate loading operations, shock absorber struts incorporating hydraulic jacks allow the glider to be lowered until the fuselage comes to rest on its skids. After loading, the aircraft is raised to normal ground clearance by hydraulic pumps fitted to each undercarriage-half.

For military purposes as many as thirty load combinations have so far been carried in the unpowered and powered versions of the "Hamilcar" (Marks I and X), ranging from tanks and guns to bulldozers, scrapers and tractors, and including a whole variety of transport vehicles. The size of the hold and the special devices for carrying and anchoring heavy, concentrated loads make this glider ideally suited for transporting a wide variety of commodities serving civilian purposes.

The carrying capacity is the same for the pure glider and the powered version of the "Hamilcar," but the latter, the "Hamilcar X," has the advantage of being able to carry, in solo-flight, 3,170 lbs. of payload over a range of 640 miles in still air.

The operational adaptability of the "Hamilcar X" in combination with the "Halifax" as tug aircraft is further increased by the fact that the "Halifax" itself can be used to carry some of the freight. To take, for example, a still-air range of 540 miles, the total maximum payload for the tug-glider combination is 32,400 lbs., of which the glider's share is 17,500 lbs. This leaves 14,900 lbs. as payload for the "Halifax." To a limited extent, therefore, the air train ideal could be met by

A four-engined Handley Page "Halifax" takes off with a "Hamilcar I" freight glider in tow.

releasing the glider en route over the destination, while the "Halifax" carries on to the terminus with its freight. Working at these loads, however, both aircraft would be loaded up to their maximum weight—necessitating the use of aerodromes with 2,000-yard runways.

Details and performance data for tug-glider combination :

Basic data	"Hamilcar X"	"Halifax III"
All-up weight.....	47,000 lbs.	60,000 lbs.
Fuel capacity	390 Imp. Galls.	1,860 Imp. Galls. (for 1,100 miles)
Payload for 1,100 miles.....	17,500 lbs.	9,500 lbs. (civil)
Payload for 540 miles.....	17,500 lbs.	14,900 lbs. (civil)
Total take-off power ..	1,890 B.H.P.	6,340 B.H.P.
Total cruising power..	1,250 B.H.P.	4,350 B.H.P.
Wing area.....	1,657.5 sq.ft.	1,275 sq.ft.

Performance at maximum gross weight :

Take-off distance until airborne . . .	1,150 yards
Take-off distance to clear 50-ft.screen .	1,950 yards
Rate of climb at sea level :	
All engines	440 ft./min.
Outer engine cut on "Halifax" . . .	225 ft./min.
Outer engine cut on "Hamilcar" . .	360 ft./min.
Service ceiling.	9,400 ft.
Cruising speed (weak mixture at 6,000 ft.)	164 m.p.h.
Min. flying speed of "Hamilcar," flaps down.	74 m.p.h.

From the commercial standpoint, the analysis on the right is very informative : it reveals the direct operating costs to be about 1/- per ton-mile or $0.20 per ton-mile, * half of which are fuel and oil costs. A low utilisation figure has been assumed because freight transport does not usually operate with the same regularity as passenger services. An annual 1,080,000 ton-miles have therefore been taken as basis, which, assuming 100,000 miles or approximately 600 hours, corresponds to a load factor of 0.75, or 24,300 lbs. of freight for a capacity of 32,400 lbs. Furthermore, it was assumed : first costs (at special prices) of £18,500 ($74,000) for the "Hamilcar X" and £10,000 ($40,000) for the "Halifax III" ; a two-man crew for the "Hamilcar" and three for the "Halifax" ; an annual fuel consumption of 50,000 Imp. Galls for the "Hamilcar" and 198,000 Imp. Galls. for the "Halifax" (total : 248,000 Imp. Galls) ; and a nylon tow-rope (Manila hemp tow-rope would be considerably cheaper).

* Exchange rate of £1 = $4.

"Hamilcar X," after release from tug, continues in powered glide.

Operating costs per ton-mile of tug-glider combination :

Cost items	"Hamilcar X" Pence ($)	"Halifax III" Pence ($)
Fuel at 2/- per gallon and oil at 6 per cent. fuel cost	1.17 (0.0195)	4.66 (0.0778)
Tow ropes, 30 tows per rope, £300 per rope	0.55 (0.0092)	—
Maintenance : Airframe [1].	0.43 (0.0072)	0.45 (0.0075)
Engines [2]	0.25 (0.0042)	0.87 (0.0145)
Crew salaries [3] plus 15 per cent. expenses and insurance	0.35 (0.0058)	0.57 (0.0095)
Depreciation [4].	1.25 (0.0208)	0.44 (0.0073)
Insurance, at 8 per cent. a year on first cost of complete aircraft . . .	0.33 (0.0055)	0.18 (0.0030)
Interest on investment, 3 per cent. of first cost.	0.12 (0.0020)	0.07 (0.0012)
Total	4.45 (0.0742)	7.24 (0.1208)
Direct operating cost per ton-mile	11.69 pence ($0.195)	

[1] £1.5 ($6) per hour per 10,000 lbs. airframe weight ; 21,500 lbs. for the "Hamilcar" and 22,500 lbs. for the "Halifax."

[2] £1.5 ($6) per hour per 1,000 cruising B. H. P.

[3] Pilots of "Halifax" at £1,000 ($4,000) and £750 ($3,000) annually ; pilots of "Hamilcar" at £850 ($3,400) and £500 ($2,000), radio operator at £500 ($2,000).

[4] Assuming three-year life for "Hamilcar" airframe, five-year for "Halifax" airframe, and 3,000 hours for all engines, with no residual value.

From a study of these figures it follows that the towing combination can only compete economically because of the low first cost assumed. Whereas towing aircraft and gliders are available at specially low prices in the present postwar conditions, the proposition would become uneconomic in normal times. It must be remembered that a good freight transport aircraft could work at similar economical figures, and simultaneously feature a superior rate of climb ; whilst the specially-designed freight aeroplane is calculated to cruise at less than 50 per cent. take-off power, the towing "Halifax" cruises at more than 60 per cent.

Meanwhile, however, an advance in the domain of technical development, such as an amelioration of pick-up methods applicable to multiple towing operations, or an improvement of blind-flying reliability, could, in the case of special applications, tilt the scales in favour of the glider.

"Hamilcar X" powered freight glider, fitted with two 965-H.P. Bristol "Mercury 31" engines.

From the Zuider Zee to the South Seas

Birth and Growth of Dutch Civil Av[illegible]

I. *Holland Very Much on the Map*

"One elephant . . . two rupees." —You may very well imagine that the Accounts Department at Headquarters raised its eyebrows at this apparent levity on the part of the District Representative. What the devil had pachyderms to do with airlines ? But there was a perfect explanation. In order to disentangle the Ceylon airport coach from a close embrace with an erring automobile, the District Representative of K.L.M. Royal Dutch Airlines had to hire an elephant from a Cingalese ; and elephants are used to "earning" 100 rupees a day . . . Two rupees for hiring an elephant : as you see, it is not only in Holland that K.L.M. manages to make itself at home.

A shipment of Christmas trees to Curaçao, hats from Brussels to Amsterdam, song-birds from Barranquilla to Schiphol, tropical fish, monkeys, bull frogs, parasol ants, deer and other animals for various zoos, Cuban tobacco to Prague, dolls from Ottawa for the Doll Exhibition in Maestricht, Argentine flamingoes to Stockholm, Java tea to Groningen, marine propeller-shafts weighing 2 ½ tons from New York to Amsterdam . . . A kaleidoscopic parade of countries, peoples and freight commodities build up the picture of K.L.M. Royal Dutch Airlines, locally known as the Koninklijke Luchtvaart Maatschappij and internationally known as the world's oldest airline company.

In K.L.M.'s first annual report, that for the year 1920, we read :

> "The public is still somewhat unwilling to make use of the new method of transport, in spite of extensive publicity and advertising in various forms. However, when this reluctance is overcome and the passenger air services are used either for business purposes or for tourist travel, we usually receive most appreciative letters . . . K.L.M. had no accidents or mishaps during the year 1920, when 584 trips were carried out and the aircraft covered a total distance of 145,183 miles, equivalent to twenty times the distance between Amsterdam and Batavia."

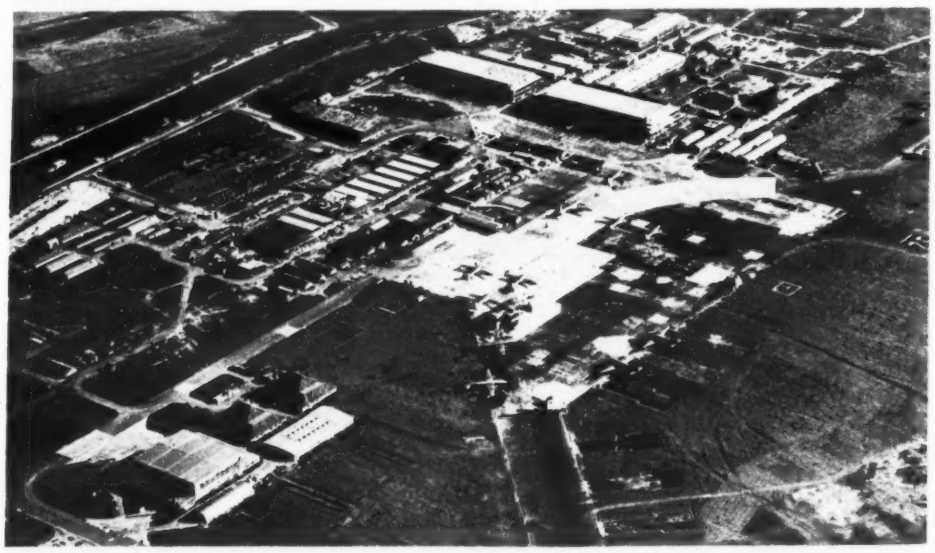
Was the mention of Batavia in this first business report looking ahead—or was it the voicing of a secretly-cherished ambition ? It goes without saying that there was no question at that time of starting an air service to the Dutch East Indies. The company had only been registered for a year—since the 7th October, 1919—and in the spring of 1920 had only just begun to try its wings. In May of 1920 converted de Havilland DH-9A "Airco" two-seat aircraft were used to start a thrice-weekly passenger service from Amsterdam to London. By the end of June of the same year daily flights were being flown ; and the first mail flights were started in July. The advent of winter, however, meant that the whole K.L.M. outfit had to hibernate.

At that time the Dutch East Indies was totally ignorant of aviation's mission. It's only connection with the Mother Country was provided by ships, which had to ply their way for months through the Mediterranean, the Suez Canal and the Indian Ocean until they reached the far-flung centres of Dutch colonial might. And, despite all this, we can still say that it was not by mere chance that the name of Batavia was featured in K.L.M.'s first annual report. It was a reference to one of Holland's main arteries, and without a doubt, to a problem of world politics.

Holland, just like every other small seafaring nation, was being ousted more and more from her colonial positions. During the centuries following her liberation from Spanish tyranny, she had built up a mighty overseas empire. In the eighteenth century Dutch trading companies were busy on the African Gold Coast, in Arabia, India and Further India, Australia (once known as New Holland ; Tasmania, for instance, is named after Abel Janszoon Tasman, the Dutch navigator who discovered New Zealand and Tasmania in 1642-43), Cape Colony, Brazil—and working on Dutch soil, too. New York was once known as New Amsterdam and was founded by the Dutch. Later on, larger nations entered the picture, and Holland soon found herself unable to keep pace with their shipbuilding programmes. The Dutch merchant fleet, once the largest in the world, occupied a relatively modest position around the beginning of the twentieth century. In the '20's of our century, Great Britain and the U.S.A. had merchant fleets of 19 and 16 million tons, respectively, compared with scarcely two million tons for Holland. Still more striking was the disproportion between the tonnage of the Dutch fighting Navy and that of the great sea powers.

A colonial empire could not be held together with a navy like Holland's. On the other hand, Holland's possessions were still very considerable at the beginning of our century. Most of all, they were very widespread, consisting of an immense number of separate groups of islands. The East Indies, Guiana and the West Indies lay on opposite hemispheres. How difficult it was to maintain

Home port of K.L.M., Schiphol international airport, Amsterdam, photographed in 1947 after it had been reconstructed.



regular connections between all these possessions, for this was essential for administrative as well as commercial purposes.

And today, with the advent of commercial air transportation, we have seen the entire problem of overseas power broached again. Small nations, too, can now find their place in colonial politics and world commerce without having to fear that their means of transportation are inadequate. World commerce is being divided up anew, and in the course of the three last decades Holland has left no stone unturned to work her way up to a top place amongst the airfaring nations.

II. *A Young Lieutenant and the General Public*

We might ask whether a twenty-nine-year-old Dutch Air Corps Lieutenant, Albert Plesman, foresaw all this when, towards the end of World War I, he conceived the idea of organising an Air Exhibition in Holland. We will not venture to give an answer to this question, but we can say that the ELTA Exhibition, opened on August 1st, 1919, in Amsterdam, was a tremendous success—there were half a million visitors, of whom 4,000 went up for joy rides—and that Plesman decidedly had a knack of arousing the interest of prominent Dutchmen in aviation . . . "You can't do it without public support," Plesman had declared in the clubhouse at Soesterberg Airfield, "and our first job is to acquire public support." And Plesman indeed did acquire public support.

With astonishing ease he solved for his own K.L.M. Royal Dutch Airlines, and Dutch civil aviation in general, one of the most difficult problems of present times: the smooth and fruitful co-operation between State and private enterprise. In the civil aviation field, this problem, which could have led, and still can lead, to violence and bloodshed, has been relieved of its poisoned fang by today's President of K.L.M., Dr. h. c. Albert Plesman. In every instance where private intervention seemed indicated, he used the right people to further his sole purpose: civil aviation. Wherever the task was beyond the limits of private enterprise, he did not hesitate to enlist the aid of State, communal and international bodies.

* * *

Whilst Dutch civil aviation was lucky enough to have found a young and enthusaistic pioneer in the person of Albert Plesman, Dutch aircraft construction was simultaneously privileged in having a no less gifted and enterprising aircraft constructor, namely A.H.G. Fokker.

Born in Kediri, Java, as the son of a Dutch coffee planter, young Anthony Fokker was a backward schoolboy, a daredevil flyer but, above all, a top-notch business man and aircraft constructor. Even if the two Flying Dutchmen, Plesman and Fokker, did not always work smoothly together, their combined efforts were to the benefit of Dutch aviation. Fokker aeroplanes, particularly the three-engined high-wing monoplanes, acquired an international reputation; and Anthony Fokker's constructions accompanied K.L.M. through its early years.

III. *Private and State Initiative*
K.N.I.L.M. and the West Indies Division

Enthusiastic private people were of immeasurable help in getting K.L.M. into the air. An American millionaire of Dutch descent, Mr. van Lear Black, chartered K.L.M. planes for dozens of pleasure and business trips, setting up a record by flying no less than 43,775 miles in 1927. Perhaps his flight to Batavia inspired the company to open a service to the East Indies, for a few months after his return the Fokker F-VII "Postduif" made the first mail and route-proving flight from Amsterdam to Batavia, a journey which was completed between October 1st and 28th, 1948; and by 1930 a weekly return service was in operation over this route. By the end of 1933 the Fokker F-XVIII "Pelikaan" had cut the flying time down to four days, four hours and 40 minutes. After 1937 twenty-one-passenger DC-3's were flying a thrice-weekly service to the East Indies. The 500th flight over this route was performed on November 13th, 1937, and the 750th flight on June 20th, 1939.

In order to operate air services in the Dutch East Indies, a number of Dutch business concerns grouped to found K.N.I.L.M. Royal Netherlands East Indies Airways, which was registered on July 16th, 1928, and inaugurated its first route, from Batavia to Bandoeng, on November 1st of the same year. A year later services were started between Batavia and Palembang and Batavia and Surabaja, and a Singapore-Medan route was opened in 1930. After that the network expanded steadily until the outbreak of World War II, and trade by air between the Mother Country and the East Indies developed rapidly and successfully:

Development of Air Traffic to the East Indies

Year	Passengers	Freight and Luggage lbs.	Mail lbs.	Hours	Aircraft-miles
1928	—	—	1,850	273	27,930
1929	2	121	11,785	1,198	122,760
1930	8	385	18,540	1,319	137,180
1931	63	4,165	40,379	5,600	587,200
1932	450	21,290	77,814	8,437	957,050
1933	789	33,050	101,260	8,666	984,435
1934	918	43,036	111,208	8,356	967,073
1935	1,554	56,070	145,024	9,968	1,463,120
1936	2,826	97,909	200,354	12,876	1,916,090
1937	3,903	132,763	303,410	13,378	2,077,390
1938	5,790	216,329	372,170	18,168	2,859,860
1939	6,156	194,205	361,610	15,689	2,410,420

Mr. van Lear Black was not the only private person to charter K.L.M. planes. Among the many more since his time, most people will recall the flight in 1947 of Mr. van Leer, the well-known Amsterdam industrial magnate who chartered a specially-converted K.L.M. aircraft for a business trip to the Near East, India, the East Indies, China and Africa. Furthermore, the Royal Dutch Shell Company has frequently chartered K.L.M. planes to transport its employees to the East or the West Indies.

* * *

A K.L.M. airport coach in Java.

On the other hand, the Dutch State has always contributed energetically towards the development of K.L.M. since its foundation. Today, the Dutch national carrier is almost entirely State-owned, with the Government holding over 97 per cent. of the shares:

	Guilders
100 Priority "A" Shares of 1,000 guilders each	100,000 (State)
90 Priority "B" Shares of 1,000 guilders each	90,000 (Private holders)
1,074 Preference Shares of 1,000 guilders each	1,074,000 (Private holders)
399 Ordinary Shares of 100,000 guilders each	39,900,000 (State)
200 Ordinary Shares of 1,000 guilders each	200,000 (Private holders)
	41,364,000

There is no lack of objectors to this development of K.L.M. into a public concern.

It should be stressed particularly in the case of K.L.M. that the company's nationalisation did not find its origin in political considerations, but resulted from the need for enlisting every national source of help. In a small country, aviation, if it has to be developed to international standards, must necessarily be regarded as a "public service *par excellence*."

Batavia, capital of Java, seen from a K.L.M. airliner.

The K.L.M. management's pleasure is understandable. The calendar year 1946 brought forth the first evenly-balanced financial report. Right : Dr. h.c. A. Plesman, President of K.L.M. ; left : Mr. H. Veenendaal, Manager.

K.L.M. Administration Building, Batavia.

One only needs to consider how unprofitable the development of services to the East Indies was at the beginning. In the first year of operations (1928) there wasn't a single passenger ; there were two passengers in the second year, eight in the third ; 63 in the fourth marked the first jump, and after that the number really started to increase. One might ask whether the subsidy contained in the Post Office Administration's guarantee of 1,100 lbs. of airmail per flight was avoidable. After all, was it not a long-term investment, the basis for life and prosperity of Dutch air transport ?

It doesn't matter whether one looks upon the Dutch as a nation of colonisers, or mariners, as a lot of shopkeepers, or as the descendants of sea-rovers. The Dutch are a tough people, and one who know its own mind ; and the development of the Dutch airline business is ample proof of this.

Following the inauguration of services to the Dutch East Indies, towards the end of 1934 K.L.M. began operating to the West Indies. On December 22nd, 1934, a three-engined Fokker F-XVIII landed at Curaçao, on Hato Airport near Willemstad, only seven years after the first pioneer flight across the North Atlantic. There was no talk of commercial aviation ; those were still the days of heroics in the air. Instead of passengers, the cabin was filled with fuel and oil tanks ; a Dutch U-boat anchored in the South Atlantic assured the aircraft's safe passage over water —like the present ICAO weather ships located in the North Atlantic—and when it landed in Curaçao, amid scenes of great enthusiasm, all the crew members were decorated by Royal decree. Those were the days ! Meanwhile, on January 19th, 1935, thus hardly four weeks later, the first inter-island service was opened in the Dutch West Indies.

At that time the Netherlands Government had to lend a helping hand ; but those who thought that this help was only temporary, were sorely mistaken. World War II thwarted many hopes ; and in 1945 K.L.M. had to start again from scratch.

IV. *Destruction and Reconstruction*

If Hitler had possessed but a remote idea of Dutch history before he ordered his airborne divisions into the field ! When trouble started brewing in Holland in 1566, when the Dutch began throwing off the Spanish yoke, Duchess Margaret of Parma, Phillip II's instrument of rule in the Netherlands, asked her financial expert, Count Barlaymont, for information about the Netherlands noblemen. Contemptuously, Barlaymont replied that they were nothing else but *"Gueux"*—beggars But from the *gueux* developed the "League of the Gueux," the noblemen partisans who chased out the Spanish invader, and whose defiant spirit was to live on, later to ward off the British and, not so long ago, to make things hot for the Germans.

It was "beggars" who won Holland her freedom, and it was beggary which faced Dutch civil aviation at the end of the last war.

Only a few Dutch aeroplanes had managed to escape to England when the Germans set foot on Netherlands soil. Under contract to, and with the support of, British Overseas Airways, K.L.M. developed a kind of traditional service between Bristol and Lisbon. With a great deal of trouble, a connection with the East Indies—first starting from Italy and later from Palestine—was maintained during the first two years of the War. Then the Netherlands East Indies was occupied by the Japanese, so that this last service had likewise to be cancelled. The developments were catastrophic. All the airfields and airport installations at home were destroyed, first by German and later by Allied bombs. Amsterdam's Schiphol airport was nothing but a heap of ruins.

There was one bright spot in this picture of desolation : the West Indies Division, where the flying equipment, ground installations, crews and thus the entire West Indies air network had emerged unscathed. After the liberation this embryon in Guiana and the West Indies was to develop into a new and bigger K.L.M. :

Development of the West Indies Division

Year	Passengers	Freight lbs.	Excess Luggage lbs.	Mail lbs.	Hours	Aircraft-miles
1935	2,654	8,798	9,740	676	406	40,453
1936	3,518	24,529	19,182	1,624	628	62,346
1937	6,293	41,989	53,180	7,140	1,320	142,135
1938	9,822	79,344	105,092	15,000	2,247	250,386
1939	14,578	95,732	162,994	23,420	3,398	342,377
1940	17,893	98,273	251,040	26,410	4,058	654,870
1941	20,513	142,454	294,288	30,542	4,179	676,670
1942	25,817	333,927	211,349	56,419	5,596	816,640
1943	33,152	474,040	251,150	121,720	7,474	1,152,380
1944	33,741	398,480	318,560	75,362	8,026	1,240,680
1945	39,648	505,510	383,180	71,676	10,431	1,862,010
1946	51,260	871,770	495,920	107,898	14,160	1,699,170
1947 *	57,300	2,094,390	660,000	150,000	* Estimated	

The K.L.M. plane chartered by the American millionaire of Dutch descent, Mr. van Lear Black, with Captain Geysendorffer at the controls. His flight to Batavia in 1927 was soon followed by a regular K.L.M. service to the East Indies.

A.H.G. Fokker, founder of the aircraft firm bearing his name.

All that was left of the patrimony was the West Indies. Otherwise, Albert Plesman, upon his return from German internment and later from England, found but the ruins of his K.L.M.

There was a dearth of airports, aircraft, pilots, technical personnel—and above all of money. And there was the farce of peace.

There is nothing peaceful about the aftermath of war. When K.L.M.'s first postwar aeroplane landed on Semarang airport, in the East Indies, its crew suffered the loss of one member. On the occasion of a later flight, aircraft and crew disappeared without a trace. In the East Indies a colonial war was fanned from the embers of Japanese tyranny, and, sympathising with the rebels, the Governments of India and Pakistan subsequently forbade Dutch aircraft to fly over their territory. Such were the conditions under which the re-birth had to take place.

* * *

And today ?

On August 1st, 1947, K.L.M. took over K.N.I.L.M. Royal Netherlands East Indies Airways, thus the entire East Indies network, and formed the Interinsular Division of K.L.M., with headquarters at Batavia.

Traffic to the East Indies began in 1927 and at the end of 1937 the 500th flight could be recorded. In 1945 this service was begun anew and already by January, 1948, a new 500th flight could be celebrated. In the beginning flights were carried out once a week ; today they are made once daily in both directions. In those days the trip took four days, and today it doesn't take more than two and a half days.

Apart from this, Dutch aeroplanes land daily in New York, several times a week in South Africa, the Dutch West Indies and in the main cities of the Latin American Republics.

Let us speak in figures and compare K.L.M.'s results of the last year of peace with those of the first postwar year :

1938	Passengers	Freight (lbs.)	Mail (lbs.)
Domestic traffic	37,104	553,335	13,360
European traffic	111,083	4,278,400	1,492,180
Amsterdam-Batavia .	5,720	212,484	371,500
West Indies Division	9,813	183,916	15,090

1946	Passengers	Excess baggage (lbs.)	Freight (lbs.)	Mail (lbs.)
Domestic traffic	112,385	9,965	285,430	—
European traffic	123,778	821,691	3,244,660	1,230,700
Amsterdam-Batavia	14,641	120,343	280,910	914,600
West Indies Division	50,212	495,924	789,500	107,898

Hato Airport, near Willemstad, Curaçao.

A Douglas C-54 of the West Indies Division of K.L.M., over Kingston, Jamaica.

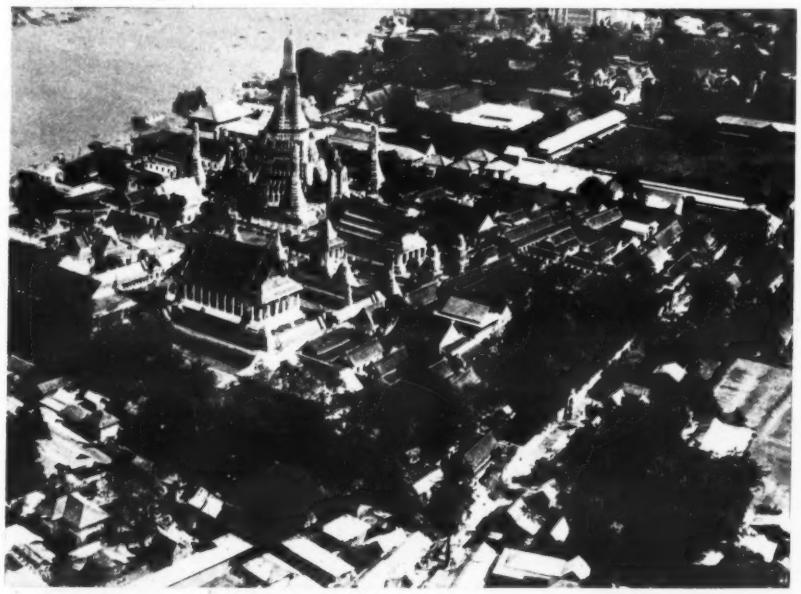
In 1946 K.L.M. succeeded for the first time in working without loss. For the first time, too, the payroll was doubled from one year to another, from 5,500 to over 10,000 employees.

* * *

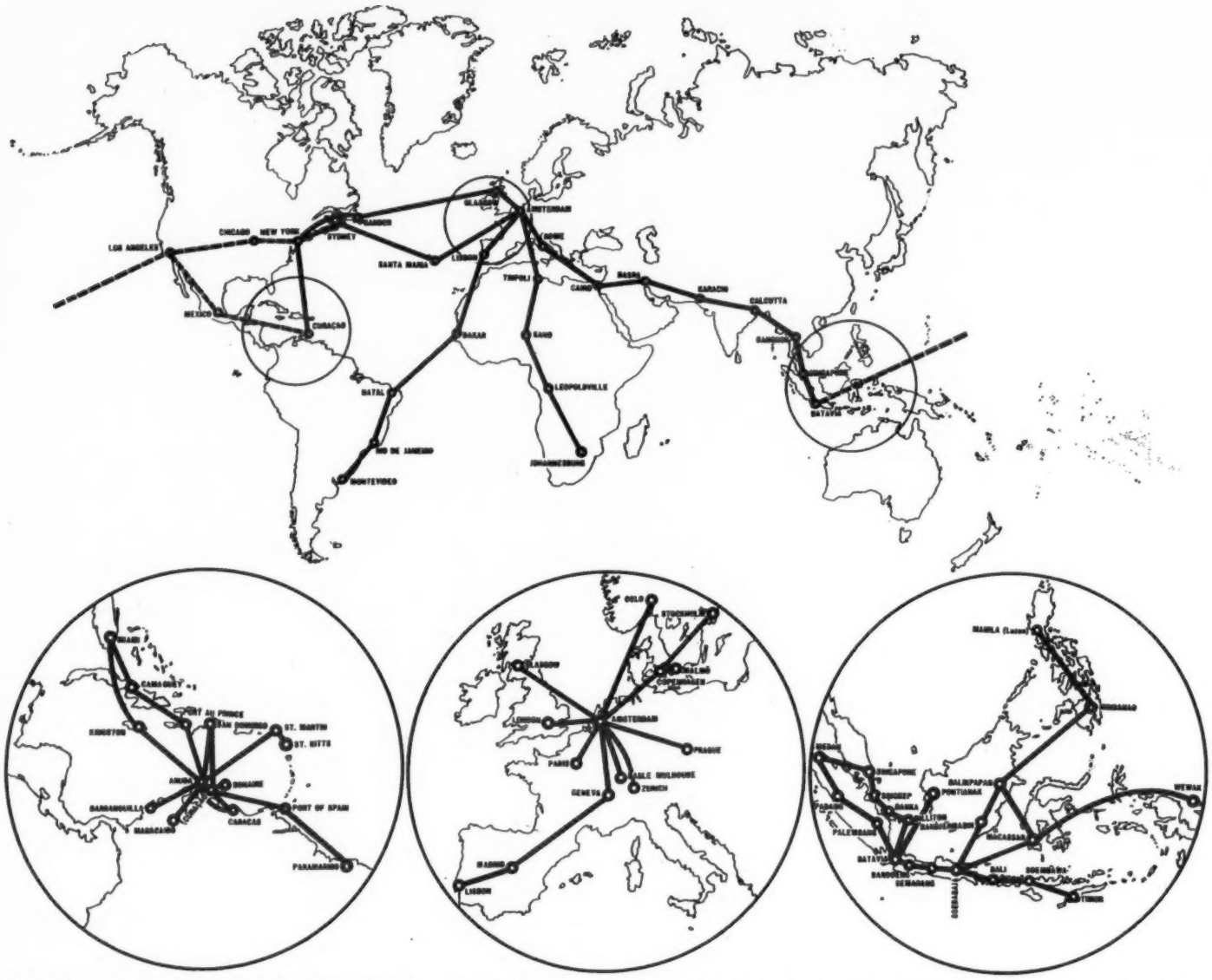
What is K.L.M. today ?

It is a European airline company of which the external aspects are reminiscent of American conditions, and are comparable with these. Just like the major U.S. carriers, K.L.M. is planning a round-the-world service, from Amsterdam via New York to Chicago, Los Angeles, Tokio, Batavia and back to Amsterdam. Just like the big U.S. companies, K.L.M. also flies to South America and South

A glimpse of Bangkok.



Crossing the Swiss Alps in the Amsterdam—Rome plane.



K.L.M. route map showing the four trunk routes : 1) *Amsterdam—Summer Season :* Glasgow—Gander—New York—Curaçao ; Winter Season : Santa Maria—Sydney—New York—Curaçao. 2) *Amsterdam—Montevideo.* 3) *Amsterdam—Johannesburg.* 4) *Amsterdam—Batavia* as well as (dotted lines) the projected round-the world route and the projected Los Angeles—Mexico—Curaçao service.
The three circles show the traffic areas of the European company, the West Indies Division and the Interinsular Division.

Africa. And, in addition, it operates an extensive European network.

Aeronautical representative of a small country, K.L.M. can only conceive the realisation of its ambitious plans under the motto of Freedom of the Air, and is a stalwart champion of the principle of the Fifth Freedom. Although the Fifth Freedom has failed to find general recognition, both at the Conference of Chicago in 1944 and that recently held in Geneva in 1947, Holland has refused to yield an inch. On February 11th, 1948, a Dutch Society for Air Law was formed at The Hague ; the *spiritus rector* is Professor D. Goedhuis, but again we find K.L.M. strongly in evidence.

What is K.L.M.'s ambition, and what is Plesman's ambition ? Simply to fly. The airfaring descendants of the old sea-rovers are dominated by the maxim of Ancient Rome : *navigare necesse est.* *He.*

The Dutch motto :
"Freedom of the Air in its widest sense."

Official Bulletin of the
FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE, PARIS

Reorganisation of ISTUS (International Commission for the Study of Gliding)

The question of reviving ISTUS (International Commission for the Study of Gliding) was raised at the General Conference of the F.A.I. held in September, 1946, in London. No definite decision was taken on this occasion. It was admitted, however, that a new organisation, whilst remaining under the aegis of the F.A.I., would have to be independent, in view of its special scientific and technical character.

At the General Conference of the F.A.I. held in September, 1947, at Geneva, it was decided to entrust the Aero Club of France with the drafting of proposals concerning a new organ to succeed ISTUS within the framework of the F.A.I. ; to define its organisation as well as its functions, and to study the technical and financial conditions under which it would work.

On the occasion of the meeting of the F.A.I. General Council in Paris on January 5th and 6th, 1948, the Aero Club of France submitted its report, o[c] which the recommendations were approved.

Before studying these recommendations, here is a brief review of what ISTUS was, and what relations it had with the F.A.I.

It was founded in 1930, after negotiations between France (Comité français de propagande aéronautique and Aero Club of France) and Germany (Rhön—Rossitten—Gesellschaft), by the following countries : Austria, Belgium, France, Germany, Great Britain, Holland, Hungary, Italy.

By 1939 twenty-one nations were members of ISTUS. Besides those mentioned above, these included : Argentina, Finland, Greece, Japan, Lithuania, Poland, Portugal, Russia, Spain, Sweden, Switzerland, U.S.A., Yugoslavia.

The task of ISTUS was to study the scientific problems presented by gliding and to promulgate its findings. The scientific and technical reports were published in "Year Books" and the delegates of member countries met once a year in general council to discuss the reports drawn up by engineers, scientists and pilots. Each meeting of the general council was marked by an international gliding competition giving prominence to the achievements in the practical domain.

On the other hand, the F.A.I. Gliding Commission (Commission du vol à voile), started in 1931, was primarily responsible for the sporting aspect and, as a matter of course, ISTUS became the F.A.I.'s scientific and technical expert in this field. Incidentally, the two organisations were presided over by the same person.

Thanks to Professor Georgii, whose meteorological research enabled pilots to use thermal up-currents after 1930, Germany was playing a leading rôle in ISTUS by 1939 ; and other countries were also beginning to take an interest in these problems.

Then war broke out.

Today, in 1948, we find ourselves in a position similar to that of 1930. The possibilities which the use of standing waves offers gliding are perhaps even more significant than those which the use of thermal up-currents offered previously—to give but one example. Hence, in order to make use of this very important aspect of gliding and to enable all countries to benefit by it, it became necessary to create a new international organisation.

As stated above, this is the substance of the decision recently taken by the General Council of the F.A.I., following the report submitted by the Aero Club of France.

This new centre of scientific and technical research is to enjoy a certain amount of independence, but as its principal rôle is to improve the performance of sporting gliders, it is only natural that it be under the auspices of the F.A.I. It shall function as technical expert to the F.A.I.'s Gliding Commission, as did ISTUS before the War, for the organisation of international competitions. Its meetings shall take place at the same time as the competitions.

Herewith the general plan of organisation :

A commission for technical and scientific research is to be formed within the framework of the F.A.I. Gliding Commission, which will thus find itself considerably enlarged owing to the addition of scientists and technicians specialising in problems concerning gliding.

These shall be the delegates of similar organisations formed within the gliding committees of the various national aero clubs.

Besides the present delegates who are devoted exclusively to the sporting side of gliding, each nation shall send to the F.A.I. Gliding Commission a certain number of delegates specially entrusted with studying the following problems :—

a) documentation and promulgation of technical and scientific studies ;

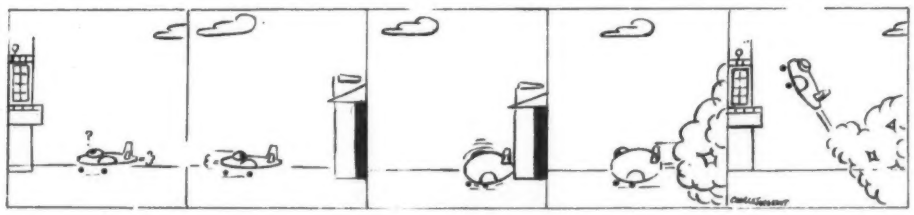
b) aerological and meteorological research applying to gliding ;

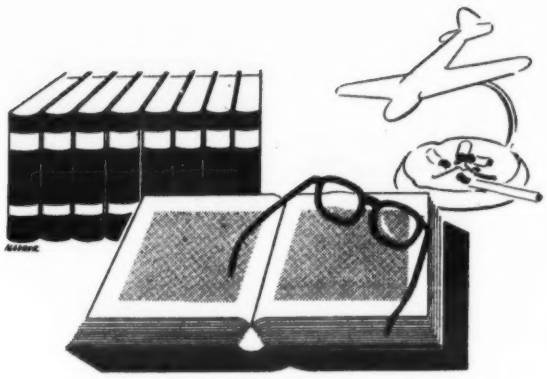
c) aerodynamic research aiming to improve gliders ;

d) application of this research to the construction and operation of gliders.

All problems dealt with in this general programme shall be promulgated in the "Year Books," which shall likewise cover the conferences held during each congress.

The first congress shall be organised in Switzerland at the same time as the International Gliding Competition, to take place at Samaden from July 19th to 31st, 1948.





Book Reviews

Esso Air World.

Standard Oil Export Corporation's Quarterly. Edited by Leonard Bridgman.

Owing to the impending termination of the activities of Intava, Inc., which for ten years had serviced the airports of the whole world with the oil products of Standard Oil Co. and Socony Vacuum Oil Co., its well-produced house magazine, "Intava World," ceased publication at the end of 1946. The final disappearance of this paper would have been regrettable, for Leonard Bridgman, well-known in connection with "Jane's All the World's Aircraft," edited it with an expert hand. It contained fine illustrations and the London firm of Samson Clark & Co., made a good job of the printing. The loss has only been temporary, however, for now we have the first issue of Standard Oil Export Corporation's new quarterly, "Esso Air World," under the same editorship and in the same handsome form. Lively and informative articles throw light on present day commercial aviation, technical innovations and modern flying equipment, as well as presenting glimpses of aeronautical history and sidelights on achievements in private flying. It makes pleasant reading and is a dignified and creditable advertisement for a world-wide concern. (English.)

T.

Parachuté en France.

By Julien Mercier. Editions Paul Dupont, Paris, 1947.

One might very well call it an adventure story, an unpretentious crime story ; but it is a story which portrays the French Resistance, the Intelligence Service and the clandestine parachute missions with a stamp of authenticity lifting the book out of the ordinary run.

It is obvious to the reader that certain of the episodes were experienced personally by the author ; others were related to him ; and there are perhaps some which represent the fruits of his imagination. The plot may hardly be out of the ordinary, but the skilful characterisation and racy style earn this book at least a modest place in war literature and—since the author obviously knows his aviation—also a place in aeronautical literature. (French.)

J.

The Modern Gas Turbine.

By R. Tom Sawyer. Published by Prentice-Hall, Inc., New York, 1947.

The numerous publications that have appeared recently on this subject are supplemented in a welcome manner by Mr. Sawyer's book. Every inch a practitioner, the author only touches on theoretical questions if this is absolutely necessary in order to give a clear understanding of the field under examination. He devotes himself primarily to the different possibilities of utilising gas turbines, either in the form of turbo-superchargers combined with combustion engines — particularly Diesel engines — or as prime movers.

Mr. Sawyer begins with a concise historical review of gas-turbine development, starting from the earliest inventions, and goes on to sketch the present-day rôle allocated to the gas turbine, as a stationary source of power and as a power plant for locomotives and ships. Subsequently the author turns to the utilisation of the gas turbine in conjunction with reciprocating aero engines, as well as to the propulsion of aircraft by gas turbines, finally to devote himself to the problems of pure turbo-jet propulsion. Here, too, his considerations are preceded by a brief historical review, dealing with the early experiments of Caproni-Campini, Heinkel, Whittle, and so forth. In his last chapter Mr. Sawyer discusses the advantages and prospects of pure jet propulsion as an aircraft prime mover. (English.)

Ba.

Aerodynamics.

By Leslie R. Parkinson. Published by the MacMillan Co., New York.

The author has endeavoured to give those not specially trained in aeronautics an opportunity to acquaint themselves with the principal laws of aerodynamics and their practical applications. At the same time the book presents a useful reference for the expert, as it gives full tables of the characteristic values most frequently occurring in aerodynamic calculations.

Mr. Parkinson divides his book into an introductory chapter on the physical properties of the atmosphere, a section devoted to the theory of aerodynamics proper, a brief explanation of flight performance calculations, the fundamentals of static and dynamic stability of an aeroplane, propeller aerodynamics, and concludes with a chapter on wind tunnels (construction and methods of measuring). (English.)

Ba.

Cours d'Aéronautique, Aérodynamique.

By Emile Allard, Professor at the Universities of Brussels and Liège. Published by Desoer, Liège, and Dunod, Paris, 1947.

The author has summarised his lectures on aerodynamics in the form of a book and thus addresses himself primarily to students of engineering and aerodynamics. Presented in a strikingly lucid and comprehensive manner this course includes, as introduction, a review of the most essential fields of mathematics to a study of aerodynamics, covering briefly the fundamental laws of vector analysis, the theory of complex numbers and that of conformal mapping.

Professor Allard gives as basis the theory of kinematics and dynamics of fluids and proceeds further to the corresponding theory of gases. Then the possibilities of applying the theory of conformal mapping to the study of the flow around a wing of infinite span (calculated in the case of the NACA 23012 aerofoil) are dealt with exhaustively.

Following a chapter specially devoted to the theory of thin aerofoils, Allard gives a brief explanation of Joukowski's transformation.

The end of the book is concerned with the theory of viscosity and turbulence and, with the most important laws of thermodynamics interwoven, the compressibility phenomena of the air at high speeds. (French.)

Ba.

Techniques of Observing the Weather.

By Benarthur C. Haynes. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London, 1947.

In this book, the author, a top level expert, Chief of the Observations Section, U.S. Weather Bureau, a Member of the De-icing Subcommittee of the National Advisory Committee for Aeronautics, and a member of numerous weather organisation, explains all the important aspects of meteorology : the terms, the methods and instruments used in weather observation. An experienced pilot, Mr. Haynes made himself a name during the War with his "Meteorology for Pilots." In 196 pages of main text, containing 98 illustrations, the structure of the atmosphere, the various cloud formations (according to the International Atlas of Clouds and States of the Sky) and the methods and devices used for measuring temperature, pressure, humidity, winds and precipitations are treated exhaustively. In addition, mention is made of the latest equipment for making upper air measurements (radiosondes, radar wind finding). Another fifty pages are devoted to references, bibliography and an appendix containing very complete tables for converting metric and English units, for determining dew points, etc., as well as suggestions for handy worksheets ; and a very complete index to facilitate quick reference. (English.)

Ri.

THE MONTH IN REVIEW

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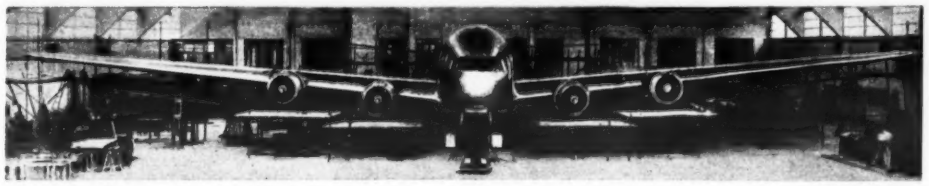

Breda-Zappata BZ 308.

AIR POLITICS

● The *British air estimates for the 1948-49 fiscal year* of £ 173,000,000 were approved by the House of Commons on March 4th. During the debate, Arthur Henderson, Secretary of State for Air, stated that all of Fighter Command's interceptor squadrons, except one, are now equipped with latest-type jet aircraft. The re-equipment of the bomber forces with jet aircraft has been deferred until new types of jet engine have been fully approved; jet-bomber aircraft of exceptional performance were "in sight." Speaking for the Conservatives, Harold MacMillan advocated the dispersal of British aircraft production to Canada.

● The agreement between the United States and Portugal providing for the use of *Lagens* airport, in the Azores, has been extended by three years.

● AIR AGREEMENTS: A *Franco-Argentine air agreement* was signed in Paris on January 30th in the presence of Dr. Enrique Ferreira, Argentine Director-General of Civil Aviation. The agreement provides for the extension of Air France's existing service from Paris to Buenos Aires on to Santiago de Chile, and for an Argentine service from Buenos Aires to Stockholm via Paris, London and Stockholm. An Italo-Argentine air agreement was signed in Rome on February 18th.

● Draft air agreements with *Switzerland, South Africa, India, Pakistan,* and *Siam* were completed at a conference of the air experts of the *Danish, Norwegian* and *Swedish* foreign ministeries in Copenhagen during the second week of February.

NEW AIRCRAFT

● The *Douglas D-558-2 "Skyrocket"* high-speed experimental aircraft has successfully completed its initial flight tests at "relatively low speeds."

● The *Curtiss-Wright XP-87* four-jet two-seater fighter made its first flight from Muroc Air Force base, Calif., on March 1st.

● After an extensive flight test programme by Republic Aviation Corp., the second prototype of the *Republic XF-12* four-engined long-range photo-reconnaissance aircraft has been handed over to the U.S.A.F. and flown to Wright Field.

● SNCA du Centre has been entrusted with the development of a 40-passenger four-engined airliner, known as the *NC 290*. It is intended to use two Rolls-Royce "Nene" turbojets (manufactured under licence by Hispano) as power plant, arranged in tandem in two nacelles. The probable cruising speed of the NC 290 is given as 405 m.p.h.

● M. Dorand, a member of the design staff of SNCA du Centre, has developed a project for a twin-engined two-rotor 17-passenger helicopter, designated *NC2042*. However, lack of a suitable power plant has caused Dorand to change the project into a smaller 10-passenger version, designated *NC 2041*, which is to be powered by two Renault 12-S-00 air-cooled twelve-cylinder in-line engines of 580 H.P.

● *North American Aviation, Inc.*, has started deliveries of its *B-45A* four-jet bomber (production version of the B-45) to the U.S.A.F. The first of these aircraft has been flown from the North American plant to the U.S.A.F. test base at Muroc.

North American B-45 jet-bombers on the assembly line.

● The Civil Aeronautics Administration has granted the *"Convair-Liner"* twin-engined airliner final type certification, thus enabling the aircraft to be put into airline service. The "Convair-Liner" was granted a limited approval certificate in November, which enabled it to be used by airline companies for crew training.

● S. A. Belge de Constructions Aéronautiques (SABCA), whose plant is at Haren airport, Brussels, announces details of a new two-seater low-wing monoplane for general training purposes, the *SABCA S 50*. Of composite construction, the aircraft is of an exceptionally simple and robust design. It is powered by a de Havilland "Gipsy Major 10" air-cooled four-cylinder in-line engine of 145 H.P. Cruising speed is 124 m. p. h., ceiling 16,400 ft., and range 375 miles.

● The *"Trojka,"* designed by Boris Cijan, is the winner of the design contest for a two-seater personal and training aircraft launched by the Yugoslav Air Force Command in the first half of 1946. The "Trojka" completed its tests at the end of 1947. It is a low-wing cabin monoplane of wooden construction. Powered by a Walter "Mikron II" air-cooled four-cylinder in-line engine of 60 H.P., it has a maximum speed of 100 m. p. h. Span is 34 ft. 5½ in., length 22 ft. 5 3/4 in., wing area 166.9 sq. ft., and gross weight 1,345 lbs.

● The *Bristol 170* transport is now available in four new sub-versions: Mk. XXI (all-freight with nose-loading doors), Mk. XXIA (mixed version with nose-loading doors for 16/20 passengers and freight), Mk. XXIIA (32/36 passenger aircraft), Mk. XXIE (with nose-loading doors and movable bulkhead, combining the three foregoing specifications.) These new versions differ from the earlier models in having increased wing span, strengthened wings and Bristol "Hercules 672" air-cooled fourteen-cylinder twin-row radials of 1,790 H.P. instead of the previous Bristol "Hercules 638" engines.

New version of Bristol 170.

WIND TUNNELS

● A new supersonic wind tunnel with speeds of up to 1,865 m. p. h. is to be built at the *Stockholm Technical College* at a cost of 200,000 crowns. The test section measures 13 in. × 13 in. The tunnel is of the intermittent type and operates for periods of one minute; after each run the compressed air tanks have to be reloaded, which takes four minutes. It is hoped to have the new tunnel in operation by October. This will be Sweden's second supersonic wind tunnel; the first is already in use at the Aviation Technical Research Laboratory at Ulvsunda, near Bromma airport, Stockholm. Under a general development programme for the Stockholm Technical College, the aeronautical department is to have a new laboratory building with another wind tunnel; likewise for supersonic speeds, the new tunnel will be driven by a 300-H. P. electric motor and will have an axial-flow compressor. The new constructions are not likely to be finished until 1955. In connection with the new facilities, the Technical College will also have two new Chairs, for Aircraft Statics, and Aero-engine Technics.

RESEARCH

● A *Technical College* affiliated to the *Royal Aircraft Establishment at Farnborough*, Hants, was opened on February 18th by Sir Stafford Cripps.

● *Dr. William F. Durand*, 81-year old NACA pioneer, was presented with the U. S. Medal of Merit on February 20th, by General Carl Spaatz, U.S.A.F. Chief of Staff. A Professor of Marine and Mechanical Engineering, Dr. Durand was appointed as a founder member of NACA in 1915. He was elected as the first civilian chairman, in which capacity he served in World War I. After having retired in 1933, he was recalled to serve again with NACA from 1941-45, notably as Chairman of the NACA Subcommittee on Jet and Turbine Power Plants.

* Excerpts from Nos. 1425-1435 (February 14th to March 9th, 1948) of "Interavia, International Correspondence on Aviation," an illustrated newsletter published thrice weekly in four language editions, English, French, Spanish and German.

INTERNATIONAL ORGANISATIONS

● The *IATA Traffic Conference for Region No. 2* (which comprises Europe, Africa and the Middle East, including Iran) concluded a meeting at Cairo on February 23rd. It recommended slight increases in various European passenger fares (due to rising operating costs in Europe) but no change in European freight rates ; reductions in rates in the Middle East region were proposed. Intensified summer schedules, particularly from European points to Egypt, Palestine, Syria, Lebanon and Turkey, were agreed upon ; 13 different companies will operate the unprecedented number of 80 round flights weekly between Europe and Cairo.

● The *ICAO Facilitation Division (FAL)* will meet in Geneva on May 17th, for the primary purpose of discussing the facilitation of international air transport by permitting unimpeded passage of aircraft, and the traffic which they carry, across national borders ; it is aimed to abolish entry visas, eliminate the examination of passengers in direct transit and to reduce many of the existing currency exchange and currency shipment formalities.

AIR TRANSPORTATION

● *B.O.A.C.* and *Northwest Airlines* have concluded an agreement for a *round-the-world service*. The route will be from New York to Shanghai, via Minneapolis, Alaska and Tokio (Northwest) and from Shanghai back to New York via India, the Middle East and London (B.O.A.C.). The fare will be $1,700 and passengers will be able to book at any office of either line. Moreover, they will be able to break their journey at any point.

● A *Scandinavian Airlines System mission* will go to India and Pakistan at the end of March. Amongst its members will be General Hjalmar Riiser-Larsen, who is in charge of preparations for new S.A.S. overseas routes.

● State estimates put the *losses of Australian railways -due to air competition* at £ 2,250,000 ; this was disclosed at a meeting of the Federal Advisory Transport Council in Melbourne, on February 10th and 11th. The figures are based on first-class fares only.

● EUROPE : *D.D.L.* (Denmark), *D.N.L.* (Norway) and *A.B.A./SILA* (Sweden) will operate their services jointly upon the introduction of the summer timetable on April 19th. The lines will operate as D.N.L., D.D.L. and A.B.A. divisions of S.A.S. in the ratio of 2 : 2 : 3. The co-operation between the three companies will also extend to special flights and freight traffic. It is expected that S.A.S.'s representation abroad will be increased whilst, at the same time, economies in representation of the other companies will be made. The pooling of the resources of the Scandinavian airlines makes S.A.S. one of the key airline companies in Europe.

● The Anglo-Italian *Alitalia* has modified its Rome—Paris schedules, following an agreement with Air France, so as to provide a connection with Air France services from London and New York.

● On March 1st *American Overseas Airlines* opened a twice-weekly Frankfurt—Berlin service. This is the initial step towards a network of German domestic services planned by both the British and American occupational authorities.

● A total of 348 (1946 : 223) *civil aircraft* were registered in *Sweden* at the end of 1947. There were 62 Piper "Cubs" and 24 Douglas DC-3's included amongst them.

● *Air France* plans to open a non-stop service from London to Nice on June 15th with Languedoc 161 airliners. Flying time will be three hours.

● *British European Airways* has ceased charging passengers for meals served on its aircraft ; the line started the practice last spring in the hope that other European operators would follow its lead.

● ATLANTIC : *American Overseas Airlines* will operate twenty trans-Atlantic round flights weekly when its summer timetable comes into force on May 1st : nine "Constellation" flights weekly between New York and London ; three "Constellation" flights from New York to Amsterdam and Frankfurt ; four Douglas DC-4 services from New York to Frankfurt, two of which will be extended to Berlin ; and four DC-4 flights weekly between New York and Scandinavia.

● On April 5th *K.L.M. Royal Dutch Airlines* will once more operate four round flights weekly between Amsterdam and New York ; on April 26th a fifth round flight weekly will be added and as from June 14th a daily trans-Atlantic service will be flown. As two weekly services from Amsterdam to Curaçao are also routed via New York, K.L.M. will offer nine round services weekly between Holland and the U.S.A. from the middle of June onwards.

● *K.L.M.* has transported a total of 31,558 passengers, 839,860 lbs. of freight and 289,150 lbs. of mail over the North and South Atlantic since it started flying the Atlantic (from Amsterdam to New York and Curaçao and to South America) in the summer of 1946, until the end of 1947.

● *Air France* should take delivery of all of its forty "*Languedoc 161*" four-engined airliners by the end of June. At the end of 1947 the airline had 15 of these aircraft. The delivery of five new Lockheed 749 "Constellations" will enable the trans-Atlantic service to be intensified gradually during the next few months to a peak of eleven flights weekly.

● On February 19th *Sabena* opened an all-freight trans-Atlantic service operated every five days with DC-4's.

● *Trans World Airline* completed its second year of overseas operations on February 5th ; a total of 2,832 scheduled trans-Atlantic flights had been flown in the period.

● *Trans Canada Airlines* will intensify its Montreal-London service from one to two round flights daily as from June 1st.

● U.S.A. : *A passenger survey conducted by the Port of New York Authority* and the nineteen regular airlines using the airports under its control showed the following results : over 39 per cent. of the 33,000 passengers questioned had incomes of less than $6,000 per year, over 38 per cent. had between $6,000 and $ 15,000, and over 22 per cent. more than $15,000 ; about 15 per cent. of the travellers were aged between 26 and 45, 27 per cent. over 45, and 16 per cent under 26 ; over 28 per cent. were women. As for occupations, professional men formed the largest group of those quizzed. Fifty-two per cent. of passengers flew for business reasons, 26 per cent. for pleasure, 14 per cent. for both combined, 8 per cent. for reasons of personal emergency. The improvements in ground service most desired were the provision of airport hotels, open parking lots at airports, garage parking facilities and arrangements for automobile rental, in that order.

● *Safety regulations for American non-scheduled operators* are to be brought closer to those of the scheduled airlines. These changes will affect about 2,600 non-scheduled lines in the U.S.A.

● The Civil Aeronautics Board has postponed the deadline for the *retirement of the Douglas DC-3* from December 31st, 1950, to December 31st, 1953.

● A total of *92,644 civil aircraft were registered with the C.A.A. on November 1st.* The oldest aeroplane still registered is a Thomas Morse TM3 "Scout" built in 1917.

● AIRPORTS : The 1948 programme for the *C.A.A. National Airport Plan* includes the construction of 2,745 airports and the development of 2,090 existing fields at a total cost of $1,048,500,000.

● The *International Air Exposition* at the New York International Airport, Idlewild, will be held from July 31st to August 8th, a month later than originally projected. The show is in connection with the official opening of the new airport.

● At the end of 1947, *Canada* had a total of 310 licenced airports : 93 permanent and 217 temporary.

SERVICE AVIATION

● The *70-group Air Force* contemplated by the U.S. A.F. comprises : 21 very heavy bomber groups (30 bombers each) with six VHB replacement groups (Boeing B-29's or newer types, such as the B-50's now being built) ; 5 light bomber groups ; 22 fighter groups ; 3 all-weather fighter squadrons ; 4 tactical reconnaissance groups ; and 22 special squadrons. Present operational strength of the U.S.A.F. is 55 groups.

● The U.S.A.F.'s Air Transport Command and the Naval Transport Service were formally merged as the *Military Air Transport Service* on March 1st.

● The *Norwegian Air Force* is to be equipped with *jet fighters* and has alreay ordered four de Havilland "Vampires" in Britain.

● The Finance Committee of the *Danish* Parliament has authorised a sum of 830,000 crowns for the purchase of British aircraft for the *Naval Air Service*.

● A *Polish Defence Committee* headed by Marshal Rola-Zymierski, Polish War Minister and Supreme Commander, recently made a visit to *Moscow*, during which it was given a promise of supplies of Soviet-Russian war material and the armament of Poland as part of the general Soviet-Russian armament programme. The Russian aid includes the training of Polish pilots in the Soviet Union.

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奇幻

XUANHUANKEJIQIHUAN

Vice-President in Charge of a Safe Smooth Flight

Besides the pilot and copilot, there's a third man in the Constellation cockpit. He is the flight engineer—a man who might also be known as the Vice-President in Charge of a Safe, Smooth Flight.

His contributions to the passengers' comfort and security are both direct and indirect.

He superintends the smooth operation of the plane's four mighty engines. And, while the plane flies high over the weather at 20,000 feet the flight engineer keeps the cabin altitude at a comfortable 8,000 feet by his operation of the Constellation's pressurizing system. He also oversees the cabin heating and ventilating devices.

And indirectly, he improves the flight by handling 60% of the Constellation's controls and indicators. This leaves the pilot and copilot free to concentrate on flying the plane smoothly and surely.

The flight engineer is just one of the many extras which results in the Lockheed Constellation's making twice as many transatlantic flights as all other air transports combined.

Lockheed Aircraft Corporation

Burbank, California

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Airlines operating — or soon to operate — Constellations are :
Aer Lingus and Aerlinte Eireann (Irish Air Lines), Air France, AOA (American Overseas Airlines), Aerovias Guest S. A., British Overseas Airways Corporation, Eastern Air Lines, KLM Royal Dutch Airlines, LAV Linea Aeropostal Venezolana, Pan American World Airways, Panair do Brasil, Qantas Empire Airways, Ltd., Trans World Airline.

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